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# PSYCHOLOGICAL AND SOCIAL ADJUSTMENT IN A SIMULATED SHELTER

## A RESEARCH REPORT

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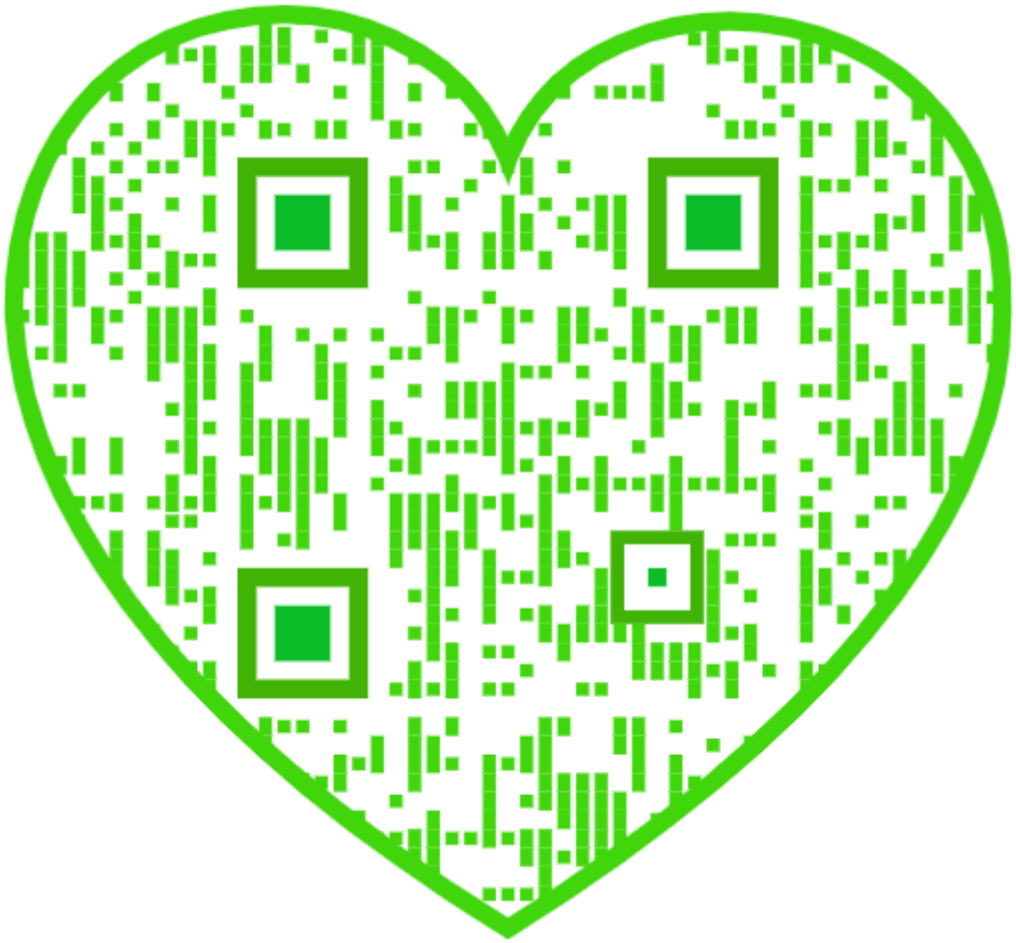

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# PSYCHOLOGICAL AND SOCIAL ADJUSTMENT IN A SIMULATED SHELTER

## A RESEARCH REPORT

James W. Altman
Robert W. Smith
Rheda L. Meyers
Frank S. McKenna
Sara Bryson

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# SUMMARY

The purpose of this study was to evaluate psychological and social factors as they relate to shelter habitability. A simulated shelter was constructed which provided for continuous auditory and visual monitoring of shelter occupants' reactions. Following a series of four short–duration pilot tests, a series of four experimental groups inhabited the shelter. Each experimental group consisted of thirty subjects and contained men, women and children. The first three groups remained in the shelter for one week and the fourth group remained in the shelter for two weeks.

Major experimental variables were temperature and presence or absence of a trained and designated manager. These variables were applied to the experimental groups as follows:

Group I–"Hot" temperature, up to an effective temperature of 85° F.; no designated manager.
Group II–"Comfortable" temperature, approximating an effective temperature of 74° F.; with a trained and designated manager.
Group III–"Comfortable" temperature; no designated manager.
Group IV–"Hot" temperature for the first week, "comfortable" temperature for the second week; with a trained and designated manager.

Subjects in the experimental groups were paid volunteers who were fully aware that there was no actual attack. It was not within the resources of this project to obtain results with a number of different groups under the same experimental conditions. It is within these limitations of using volunteers in a simulated situation and without replication that results from this study must be interpreted.

Subjects, who were of both sexes and ranged in age from seven to 72, lived under simulated shelter conditions for up to two weeks without apparent serious psychological or social stress in most cases.

The eight square feet and 58 cubic feet provided per occupant in this study appeared to be fully adequate. Design of bunks for easy conversion from night to daytime shelter configurations was an important factor in making the amount of space adequate. Effective temperatures up to 85° F were tolerable, but appeared to be close to the upper threshold of tolerance.

Trained and designated managers increased the over-all adjustment to shelter living and enhanced attitudes toward shelters, civil defense, and people in general as compared with shelter groups not having trained management. Under the guidance of a trained manager it was possible to provide in–shelter training which was effective in teaching shelterees information relevant to post-shelter survival.

Agitation and tension were greatest immediately following shelter entry and

prior to anticipated release. Mild depression was common toward the middle of shelter stay. These effects were minimized through effective management. Desire to leave mounted steadily for most people from the time of shelter entry, but did not become overwhelming within a period of two weeks.

Shelter adjustment seemed to be a fairly direct reflection of individuals' general pre-shelter adjustment pattern. Although there was a general lack of direct interpersonal conflict in all groups, it was especially notable in the groups having a pre-trained and designated manager. Strong individual loyalties and general *esprit de corps* grew rapidly.

Psychological and social problems identified in this study which might be important in a real shelter are:

- Maximizing management effectiveness
- Providing a situation conducive to adequate sleep
- Minimizing conflict of social, moral, and ethical values

Additional psychological and sociological studies should provide useful techniques in each of these areas.

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# CHAPTER 1. BRIEF OF THE STUDY

## PURPOSE

The general purpose of the work described in this report was to study the psychological and social reactions of people to confinement in a simulated shelter for a period of up to two weeks. An additional purpose was to identify specific factors in the internal design of shelters having a significant effect on habitability. These factors included:

- Space
- Temperature
- Design factors such as bunking, internal layout, sound level, and cooking facilities
- Supplies

A final purpose was to identify patterns of organization, leadership, and activity which enhance shelter habitability and prepare inhabitants for post-attack adjustment and reconstruction.

## FACILITIES

The basic design of the experimental facility was that of a room within a room. The inner room simulated the inside of a fallout shelter. The outer room was used for observation through one-way screens and for audio monitoring. This outer room also provided for atmospheric monitoring instruments, closed circuit television, and a number of automatic recording devices.

A plan view of the shelter is shown in Figure 1. A panoramic view of the shelter is shown in Figure 2. As can be seen from these illustrations, the major part of the shelter was taken up with bunks unless they were disassembled for daytime activities. In Figure 3 are shown various candid shots of the occupied shelter.

The simulated shelter was built with one movable wall. As shown in Figure 1, this wall could be placed in any of three positions. During the three initial pilot tests, the middle sized shelter was used. During a final pilot test and four experimental tests the smallest shelter size was used as shown in the figure.

Prior to the beginning of each test the simulated shelter was stocked with all supplies for the duration of the occupancy.

## EXPERIMENTAL PLAN

Eight different groups participated in the study. The first four stayed in the shelter only over a weekend. The purpose of these four groups was to test the

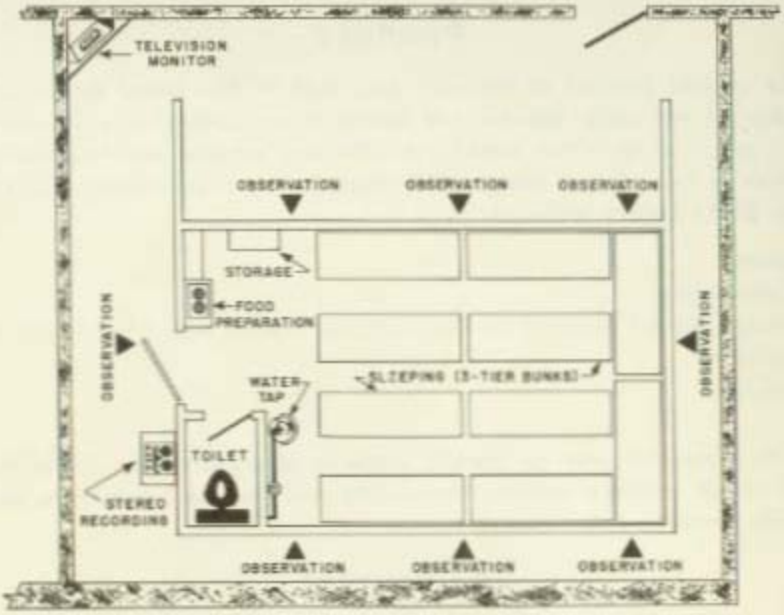


Figure 1. Plan View of Shelter.

Figure 2. Panoramic View of Shelter.

Figure 3. Candid Shots of Occupied Shelter.

facilities and procedures. More specific information concerning these groups is shown in Table I.

**Table I – Summary of Pilot Groups**

| Studies | No. of People | Length of Stay | Size of Shelter |
|---|---|---|---|
| Pilot #A | 7 | 22 hours | 19'9" x 14'9" x 7'3" |
| Pilot #B | 15 | 31 hours | 19'9" x 14'9" x 7'3" |
| Pilot #C | 25 | 44 hours | 19'9" x 14'9" x 7'3" |
| Pilot #D | 27 | 44 hours | 19'9" x 12'3" x 7'3" |

In original planning, the major experimental variables were to be:

- Amount of space available per shelter inhabitant
- Presence or absence of a trained and designated leader with an organized program.

On the basis of results during pilot tests it was decided to substitute changes in temperature in place of the space variable, since even the smallest space (about 8 square, 58 cubic feet per person) appeared to be quite adequate from the psychological and social point of view.

With the revised plan, the four experimental groups were defined as shown in Table II.

**Table II. Summary of Experimental Groups**

| Studies | Number of People | Length of Stay | Size of Shelter | Temperature | Designated Leader |
|---|---|---|---|---|---|
| Experimental #1 | 30 | 1 week | 19'9" x 12'3" x 7'3" | High | No |
| Experimental #2 | 30 | 1 week | 19'9" x 12'3" x 7'3" | Moderate | Yes |
| Experimental #3 | 30 | 1 week | 19'9" x 12'3" x 7'3" | Moderate | No |
| Experimental #4 | 30 | 2 weeks | 19'9" x 12'3" x 7'3" | High (1st week) Moderate (2nd week) | Yes |

## MEASURES

Three major types of measures were used in this study:

- Pre-test
- In-shelter
- Post-test

Pre-test measures were used for screening, matching of groups, and to provide background information to assist in the interpretation of experimental results. Relatively little screening was done except where there were disproportionate numbers of volunteers in certain occupational or age groups. Because of serious limitations on numbers of available volunteers, it was possible to do only rough matching of the four experimental groups on relevant personal history variables. Pre-tests included;

1. *Interviews:* Relatively informal, semi-structural discussions with members of the project staff concerning the subject's personal history and attitudes toward the study.
2. *Physical:* A thorough medical examination to insure that the subject had no physical ills that would make it dangerous for him to participate nor that might infect others, supplemented by a quick check immediately before entering the shelter to insure no active infectious disease.
3. *Tests:* Including civil defense information and attitudes, psychological tests of intelligence and personality.

While participants were in the shelter, four major types of measures were made:

1. *Observations:* Including standard forms completed by observers from visual and auditory monitoring of activities. This was supplemented by periodic photographing and continuous voice tape recording.
2. *Automated or instrumented:* Including water usage, frequency of radiation monitoring, sound level, and lavatory occupancy.
3. *Environmental:* Including dry bulb temperature, wet bulb temperature and carbon dioxide at the exhaust, dry and wet bulb temperature at the input vents, and dry bulb temperature at three different positions in the shelter.
4. *Self report:* Daily diaries kept by the subjects.

Post-test measures included:

1. *Attitude and information:* Re-tests on alternate forms from pre-test measures.
2. *Questionnaires:* To obtain subject's evaluations of their shelter experience.
3. *Interviews:* To supplement information about individual reactions to the experience.

## SAMPLE

The sample of participants included persons of both sexes of ages from seven through 72 years. They came from all walks of life and represented a variety of occupations. However, difficulty was experienced in obtaining the services of

employed males of more than 25 years of age, especially from executive and professional occupations. There were no children less than six years old and no persons with serious active medical or psychological problems at the time of entry into the shelter. However, only about one per cent of the candidates were rejected for major psychiatric reasons. Each subject received an honorarium of $50 per shelter stay.

In Table 1 we presented statistics for personal history and background information for each experimental group. Although an attempt was made to at least roughly equate all groups on the various background variables, difficulties in obtaining volunteers necessitated taking most volunteers when they were available, regardless of background data.

## LIMITATIONS

There are a number of experimental and statistical refinements which are not feasible within the scope of this study. However, the major limitations probably stem from the following factors:

- Subjects knew this was not the "real thing."
- Most of the subjects had some interest in and sympathy for civil defense.
- Many of the measures for different individuals in a given group are not experimentally independent because of the high degree of interaction among subjects.

### Knowledge that it was not the real thing

It was the major purpose of this study to identify the extent to which shelter confinement *per se* is a psychological and social stress. This study does permit an evaluation of this factor. However, it is crucially important that results from this study be applied to the conditions in real shelters under an attack situation only with the realization that the additional stresses inherent to an attack situation were not present in this study.

### Use of volunteers

In general, it was to be expected that highly motivated volunteers of the type recruited as subjects in this study would adjust better to shelter confinement and be more receptive to leadership and civil defense training than would persons who are basically opposed or indifferent to civil defense. Additionally, shelterees in a real attack must come out of the shelter prepared to cope with stringent post-attack conditions. Any debilitating shelter stress might therefore be much more serious than effects on volunteers who could return home for rest prior to return to their normal peacetime lives.

### Experimental independence within groups

An example of this lack of independence is that an extremely effective or ineffective undesignated leader may have a profound influence on the behavior of

## Table III – Personal History and Background Data

| VARIABLE | GROUPS I | II | III | IV |
|---|---|---|---|---|
| OCCUPATION | | | | |
| Professional | 0 | 2 | 1 | 1 |
| White Collar or Service | 8 | 5 | 5 | 6 |
| Skilled Labor | 0 | 1 | 1 | 0 |
| Unskilled or Semi-Skilled | 0 | 1 | 0 | 0 |
| Housewife | 5 | 3 | 6 | 5 |
| Student | 13 | 11 | 12 | 16 |
| Unemployed | 4 | 7 | 5 | 2 |
| AGE | | | | |
| 7-11 | 3 | 2 | 2 | 4 |
| 12-16 | 4 | 4 | 6 | 7 |
| 17-21 | 9 | 5 | 7 | 6 |
| 22-26 | 2 | 5 | 3 | 1 |
| 27-31 | 2 | 1 | 1 | 3 |
| 32-36 | 5 | 2 | 2 | 2 |
| 37-41 | 1 | 1 | 1 | 2 |
| 42-46 | 3 | 4 | 2 | 1 |
| 47-51 | 1 | 2 | 3 | 3 |
| Above 51 | 0 | 4 | 3 | 1 |
| SEX | | | | |
| Male | 14 | 16 | 9 | 17 |
| Female | 16 | 14 | 21 | 13 |
| RELIGIOUS AFFILIATION | | | | |
| Protestant | 13 | 13 | 15 | 25 |
| Roman Catholic | 16 | 11 | 14 | 3 |
| Jewish | 0 | 2 | 0 | 0 |
| Other | 1 | 4 | 1 | 2 |
| MARITAL STATUS | | | | |
| Married | 11 | 8 | 7 | 10 |
| Divorced or Widowed | 0 | 2 | 2 | 0 |
| Single | 19 | 20 | 21 | 20 |
| CIVIL DEFENSE EXPERIENCE | | | | |
| Yes | 4 | 5 | 2 | 9 |
| No | 26 | 25 | 28 | 21 |
| EDUCATION | | | | |
| Less than High School Graduate | 17 | 15 | 18 | 14 |
| High School only | 6 | 2 | 0 | 7 |
| Non-College Post High School Training | 3 | 5 | 7 | 1 |
| College Attended but not Completed | 4 | 5 | 3 | 6 |
| College Completed | 0 | 3 | 2 | 2 |
| WONDERLIC PERSONNEL TEST (adult intelligence) | | | | |
| Number of Subjects | 21 | 24 | 22 | 18 |
| Mean | 21.0 | 22.2 | 20.6 | 25.3 |
| Standard Deviation | 9.5 | 9.0 | 9.7 | 8.6 |
| OTIS MENTAL ABILITY TEST (child intelligence) | | | | |
| Number of Subjects | 8 | 6 | 7 | 10 |
| Mean | 111 | 119.5 | 115.6 | 113.7 |
| Standard Deviation | 8.7 | 16.2 | 19.7 | 14.7 |
| INSTITUTE FOR PERSONALITY AND ABILITY TESTING ANXIETY INDEX | | | | |
| Number of Subjects | 25 | 25 | 25 | 23 |
| Mean | 23.0 | 20.4 | 24.1 | 26.7 |
| Standard Deviation | 7.7 | 9.4 | 9.5 | 10.8 |
| PITTSBURGH INVENTORY | | | | |
| NEUROTICISM | | | | |
| Number of Subjects | 25 | 25 | 23 | 22 |
| Mean | 7.7 | 9.0 | 9.6 | 8.6 |
| Standard Deviation | 5.0 | 4.8 | 6.4 | 3.7 |
| INTROVERSION-EXTROVERSION | | | | |
| Number of Subjects | 25 | 25 | 23 | 22 |
| Mean | 13.8 | 13.0 | 14.3 | 14.1 |
| Standard Deviation | 3.6 | 3.8 | 4.4 | 5.0 |

all persons in the shelter. To treat individual observations as if they were experimentally independent in the statistical analysis would, therefore, result in substantial error. A major implication of this is that, in many areas of data analysis and group comparison, results are much closer to a series of case studies than to a rigorous experimental design. Theoretically, it would be very simple to solve this problem through the use of many groups under the same experimental conditions, thereby drawing "degrees of freedom" from group replications. However from an economic and practical point of view, this was unfeasible. Because it was necessary to limit the current study to one group under a given set of conditions, extrapolation from this study must be done largely on the basis of qualitative logic rather than on the basis of rigorous statistical inference.

# CHAPTER 2.
# DESCRIPTION OF PILOT GROUPS

## INTRODUCTION

Prior to the initiation of the one week and two week shelter habitability tests, four weekend pilot studies were conducted. These pilot studies involved from 22 to 44 hours. Their function was to provide information concerning the adequacy of shelter conditions, equipment, and supplies, and to test the feasibility of the procedures developed for observation and monitoring of in-shelter behavior. Experimental groups are described in detail in the various chapters which follow.

## PILOT STUDY A

The first occupancy of the shelter was by six members of the project staff and one member's eight year old son for a period of 22 hours. During this and the succeeding two pilot studies the movable shelter wall was positioned in the intermediate position which resulted in a shelter area of 292 square feet.

The main purpose of this first study was to familiarize the project staff with the conditions of shelter living and to alert them to any unforeseen problems. There were no observers stationed outside of the shelter, but members of the shelter group took turns standing "watch" throughout the night. Three meals were prepared and eaten by the group. The major activities were reading and talking.

## PILOT STUDY B

Nine men and six women from the American Institute for Research staff served as subjects in the second pilot study, which began at 10:30 a.m. on a Saturday and terminated at 3:30 p.m. the following day. On this and all subsequent studies two members of the project staff observed the shelterees continuously and recorded their observations on standardized forms.

When the group entered the shelter the first response was to investigate the shelter and to survey their supplies. The shelterees then seated themselves on bunks and stools and engaged in light conversation as they waited to see what would happen. Although no one had been designated as group leader, one of the senior professional staff members had been previously instructed in the use of the apparatus for measuring the oxygen and carbon dioxide in the shelter atmosphere. Perhaps this knowledge was one factor which led to the assumption of an informal leadership role on his part.

After the group had been in the shelter for about fifteen minutes the first CONELRAD message was broadcast through the simulated shelter radio. This message and four succeeding messages at approximately ten minute intervals

warned of an imminent nuclear attack. At the conclusion of the fifth message the shelter electricity was turned off to simulate the dropping of the bomb. The reaction to all of these messages was either light hearted or apathetic as they were not taken seriously. One reason for this may have been that the shelterees were acquainted with one another and with members of the project staff. In about ten minutes the power was restored to the shelter. CONELRAD messages continued throughout the day informing the group about the results of hypothetical attack, both locally and throughout the nation.

Soon after the power was restored two of the women started the preparation of lunch which consisted of warmed baked beans, tuna fish, melba toast, and reconstituted powdered milk. A schedule was prepared with two women being responsible for the preparation of each meal and two others assuming the responsibility for dishwashing and cleanup.

Most of the afternoon was spent reading, talking, and playing cards and checkers. Little attention was paid to the periodic CONELRAD broadcasts. A request was made to the subjects that the oxygen, carbon dioxide, and shelter temperature were to be reported over the shelter telephone each hour. The shelterees previously instructed in the use of the monitoring equipment assumed responsibility for these reports, but several of the men showed an interest in the use of the air analysis apparatus. At 5:30 p.m. the dinner of beef stew, melba toast, beverage, and fruit cocktail was served and in about two hours everyone had finished eating and the dishes had been washed.

The evening activity was quite similar to that in the afternoon, except that it was somewhat quieter and the group appeared to be more relaxed. There was group singing later in the evening and the general morale seemed quite good. By this time the man who had been responsible for the air analyses had clearly emerged as shelter leader and he announced that lights would be turned down at 11:00 p.m. There was a slight protest, but the group went along with his decision. Lots were then drawn among the men for assignment to the two hour watches, and the night lights were switched on as scheduled. One group continued to play poker for about an hour and a half using a reading light, but the rest of the group went to bed.

There was relatively little activity throughout the night except for some abortive attempts to see through the one-way observation windows by the subjects on watch. The duties of the watch detail were to maintain a CONELRAD log, and a log of the temperature and air analyses. At 1:00 a.m. they were instructed over the shelter telephone that the radiation level was low enough to permit the dumping of garbage through the hatch in the toilet area. This was accomplished with some difficulty due to the fact that it had been stored in large bags.

At about 8:00 a.m. on Sunday, most of the group were out of bed and breakfast preparation started. The breakfast of reconstituted orange crystals, dry cereal, heated prefried bacon, melba toast, and coffee was served at 8:30 a.m.

The dishes were then washed and recreational activity resumed. At 10:45 a.m. a CONELRAD broadcast stated that evacuation of shelters in the Pittsburgh area would be possible in about five hours. The group responded to this announcement with general comments that shelter occupancy had not been difficult. Lunch preparation started around noon. Lunch included cream of mushroom soup, melba toast, corned beef hash, and beverages.

A CONELRAD message announcing that shelters in this area were to be evacuated was broadcast at 3:00 p.m., and five minutes later the shelterees were called on the shelter telephone and told to have a reconnaissance team ready to leave the shelter at 3:15. The woman who answered the phone and one of the men volunteered for this assignment. They were permitted to return to the shelter after five minutes with the instructions that the shelter was to be evacuated at 3:30. The group left the shelter at this time in an orderly but jubilant manner.

## PILOT STUDY C

This pilot study differed from the preceding two in that it extended over two nights, it included a larger group of shelterees, and most of the subjects were not acquainted with each other prior to the shelter entry. Among the 25 subjects were eight adolescents (age 12 to 18), three married couples, and a 52 year old woman who had been blind for many years. This group entered the shelter at 7:00 p.m. on a Friday and was released at 3:00 p.m. Sunday.

The reactions of this group after shelter entry were quite similar to those in the previous study, in that there was much loud talking and nervous laughter as they explored the shelter. Although they attended to the CONELRAD broadcasts they did not appear to take these broadcasts very seriously. Three of the men assumed some leadership functions, but the general atmosphere was *laissez-faire*. After the simulated attack occurred at 8:00 p.m. one of the men made coffee and there was a snack break for beverage and candy. A suggestion was then made that perhaps the children should go to bed, but this met with little support from the children. The night lights were turned down at about 11:00 p.m. and most of the group turned in. Four adults quietly continued a card game using bed lamps, but in the next hour there were several verbal exchanges between adults who wanted to sleep and the teenagers who were talking rather loudly. This particular problem, incidentally, plagued most of the succeeding groups in both the pilot and the experimental studies.

Soon after midnight, when the group seemed to be fairly well settled for the night, one of the subjects, a 21 year old man, got out of bed, put on his shoes and shirt and announced that he was leaving the shelter. He called "Central Control" over the shelter telephone and said, "I'm a party pooper—I want out—it's too hot in here." No effort was made to change his mind and he was permitted to leave shelter at 12:45 a.m. In the post-exit interview he said that he had had a headache for several hours, felt dizzy, was too hot, and that the noise bothered him. The shelter temperature was 81° at the time he left. Although this was above the comfort level, it was felt by his interviewer that he had never been highly moti-

vated to remain, and wanted to spend the night "doing the town" with some of his friends who later came and picked him up. It is interesting, however, that he volunteered to participate in a future study.

There was some discussion by the group as to the reason for the subject leaving, and the suddenness of his departure. The general feeling seemed to be summed up by the statement, "Well, at least there's one more bunk and one less person to use up the oxygen." At about this time one of the men suggested that they draw lots for the night watches. Two men were assigned to each two hour watch period. The rest of the group then settled down and went to sleep. These men maintained a CONELRAD log, took periodic analyses of the oxygen and carbon dioxide and reported these to "Central Control" as instructed.

The shelterees gradually woke up between 7:00 and 8:00 a.m., and had breakfast which was prepared by two of the women. Several of the bunks were moved to allow more room for moving around and a recreation area for card games. During the remainder of the day sub-groups were formed primarily on the basis of age, with the teen-agers talking, playing chess and checkers, and reading, the young couples playing monopoly, the older women conversing. Several people napped after lunch and the atmosphere was quite relaxed and quiet. Late in the afternoon one of the leaders suggested that they play "charades" and about half of the group joined in and appeared to have a great deal of fun.

During a routine air analysis before dinner, it was noted that the oxygen reading had gone down to 17%. Successive readings showed less and less oxygen and when the apparatus indicated only 9.5% oxygen, "Central Control" was called and notified. The shelterees were advised that since the carbon dioxide had not increased, the oxygen readings were in error due to exhaustion of the absorption fluid. (This fluid should be replaced after about 25 readings at 20% oxygen.)

Dinner was served at 6:00 and lights were turned down at 11:00. The shelter quieted down in about an hour and watch was maintained as during the previous night.

The final day in the shelter was uneventful. The usual games of cards and monopoly were played and several people lounged and read. The sub-groupings continued to be based on age.

A CONELRAD broadcast at 2:45 p.m. announced that the radiation level was low enough to permit evacuation. A call from "Central Control" requested that a reconnaissance team be prepared to leave in ten minutes. At that time the door was opened to permit their departure. They returned a few minutes later with the instructions to evacuate the shelter and this was done in an orderly manner.

One of the interesting observations based on this pilot study was the ease with which the blind woman adjusted to shelter living. She entered into the shelter activities and was well received by the others. Another observation was the formation of a teen age sub-group which tended to interfere with quiet hour at night.

## PILOT STUDY D

For the final pilot study, the movable wall was positioned to give a shelter width of 12 feet 3 inches and an area of 242 square feet. This was the minimum size to which the shelter could be adjusted and was the size used in the four experimental studies which followed. Another way in which this study differed from the previous ones was that the temperature was permitted to rise to an appreciably less comfortable level. The 27 subjects included five representatives from the staff of the Office of Civil and Defense Mobilization (OCDM), one representative from the National Academy of Science (NAS), one representative from the Public Health Service (PHS), six members of the American Institute for Research (AIR) staff, and 14 volunteers from the general public.

The project staff deliberately refrained from giving the participants in this study any information concerning appropriate in-shelter roles or procedures. The purpose was to observe the emergence of shelter leadership and group structure under highly ambiguous conditions.

The inclusion of OCDM, PHS, and NAS representatives along with members of the AIR staff and the general public led to certain conflicts and organization difficulties. The former group apparently intended to play the role of passive observers and allow the leadership and organization to emerge from the general public, whereas the other shelterees looked to the OCDM representatives as "experts" who would take over shelter organization. The fact that four of the AIR volunteers had participated in a previous pilot study and hence had some experience with shelter living added to the conflict by casting them in somewhat of a leadership role. The reluctance of either the OCDM or the AIR personnel to accept the leadership functions which the others expected of them resulted in less efficient handling of shelter problems and lower group morale than in the previous studies. One of the ways that this manifested itself was in the conflict that arose both nights between the older people who wanted the shelter quiet for sleeping and the adolescents and young adults who played games and sang well past midnight. This led to several hostile verbal interchanges. The general level of conflict and leadership ambiguity was higher in this group than in any which preceded or followed. This was accompanied in post-test comments by a generally less favorable response to others in the shelter than was true for any other group.

A factor investigated in this pilot study was the group's reaction to relatively high temperatures. Since the refrigeration portion of the air-conditioning system was not yet operative at the time of this study, the ventilation and temperature were controlled by varying the volume of air circulated through the shelter and the percentage of fresh air. Wet and dry bulb temperatures were determined within the shelter by an OCDM representative using a sling psychrometer, as well as from the recording wet and dry bulb thermometers in the shelter exhaust duct. These were converted to "effective temperatures" using the A.S.H.A.E. Comfort Chart for Still Air. The effective temperatures fluctuated from 80°F to 86°F when

measured within the shelter at head level. These were up to three degrees higher than the measurements in the exhaust duct.

As the effective temperature within the shelter approached 85°F, many of the men removed their shirts and the level of activity dropped sharply. Not only did the shelterees perspire profusely, but they made many comments about the high degree of discomfort. This was particularly noticeable during periods when the air circulation was stopped. In post-shelter interviews several of the subjects indicated that they felt the temperature would have been unbearable over a period of even a few days. On the basis of these observations it was decided that the effective temperature should not exceed 85°F during any of the experimental studies to follow.

At the conclusion of this pilot study, the representatives of the OCDM and the NAS who had served as participant-observers, submitted a number of suggestions which were used in formulating the procedures for the experimental studies.

# CHAPTER 3.
# THE EFFECT OF SPACE ON SHELTER BEHAVIOR

This study did not generate direct experimental data concerning the amount of shelter space required. The simulated shelter was designed so one wall could be moved to provide three different sizes of shelter. With 30 shelter occupants, the three different shelter sizes would have provided about 8 square feet, 10 square feet, and 12 square feet per person. It was the intention that two sizes be chosen for experimental comparison on the basis of results from pilot tests. However, results from pilot tests suggested that the 8 square feet was fully adequate and that extensive testing at a larger size would not be a worthwhile expenditure. Key personnel from the Office of Civil and Defense Mobilization who participated in a weekend test with the smallest size shelter concurred in this decision.

Although no experimental comparison of different amounts of space was made, there are some relevant data generated by the study. These data are:

- The expressed attitude of subjects toward crowding.
- Behavior observed under confinement at 8 square feet.
- Overcrowding beyond the capacity for which the simulated shelter was designed.

## SUBJECTS' ATTITUDE TOWARD CROWDING

Subjects were asked in their post-shelter questionnaire to evaluate the relative discomfort of 21 different factors in their shelter stay. Results for all of these factors are described in Chapter 7. Crowding was given an over-all rank of four out of the 21 factors. Lack of water, temperature and humidity, and lack of exercise, were evaluated as being greater sources of discomfort than crowding. Only three subjects named crowding as their biggest in-shelter problem.

Because of its close relationship and frequent confusion with crowding, the evaluation of lack of privacy as a discomfort factor may also be of interest here. Lack of privacy was given an over-all rank of 11 out of the 21 factors. In addition to the four factors previously identified dirt, sleeping difficulty, noise, physical symptoms, food, and behavior of others were evaluated as being greater sources of discomfort than lack of privacy. Only one subject named lack of privacy as his biggest in-shelter problem.

Goldbeck and Newman (1960) in their study of the Naval Radiological Defense Laboratory shelter occupancy did not differentiate lack of space from lack of privacy on their post-occupancy questionnaire. Lack of space was found to be

the second most difficult living condition, with lack of water (for washing) being named as the greatest difficulty.

In the current study, during post-shelter interviews and informal conversations, the overwhelming response seemed to be that crowding *per se* was not a serious problem once initial adjustment took place. A number of persons reported being almost overwhelmed by the small size of the shelter upon initial entry. This feeling subsided rather quickly, usually within an hour or less. A typical response might be, "that room looked awfully small at first but gradually the walls started to grow."

The phrase, "the walls started to grow" was used frequently by subjects in discussing the size of the shelter. Followup discussion of this phenomenon suggested that this was more than a simple figure of speech. Apparently the shelter actually appeared to be larger after a period of time than it appeared upon initial entrance. The reverse phenomenon was apparently also experienced. A number of subjects also informally mentioned "how big" things looked upon exit from the shelter. Thirteen persons mentioned this size distortion as causing temporary difficulty in readjusting to the post-shelter situation. For example, difficulty might be experienced in climbing steps because they looked higher than they normally would.

Of the 105 subjects reporting their most unpleasant memory on a followup questionnaire, only one named crowding and none named lack of privacy.

## OBSERVATION OF BEHAVIOR UNDER CROWDING

Systematic observation techniques were not intended to identify and measure crowding-related behavior since there was no experimental control for the space variable. However, informal observation did suggest the following factors which appeared to be related to crowding:

- Staying Put
- Speed of Movement
- Warnings and Apologies

### Staying Put

Many persons moved about the shelter only when they needed to go to the lavatory or when the shelter routine required such movement. Although some restricted movement was probably due to general anxiety (the type of immobile behavior typical of some insecure persons at parties), much of this restricted movement was probably a direct adjustment to crowding. Many of the "non-movers" seemed quite alert and active within their limited area of activity. For example, a group of young people might spend almost all of their time on a couple of upper bunks, yet seem uniformly active, happy, and "at home" in the shelter.

### Speed of Movement

A number of minor accidents occurred early in the shelter habitation as a

result of sudden movements in crowded conditions; e.g. elbows in the ribs, bumping, spilled coffee. Gradually, however, shelterees seemed to slow down their movements. At first this seemed to be a fairly deliberate attempt to slow down, accompanied by exhortations to children to "take it easy." After the first couple of days, however, the slower and more controlled movements seemed to become almost automatic. Even with the slower movement, some of the larger persons had difficulty in moving about in the confined space without knocking things and people.

**Warnings and Apologies**

Movement in the shelter involved a fair amount of requiring others to move out of the way or bumping into other shelterees. This resulted in something of a paradox concerning manners or "movement folkways." Some shelterees reported that after a while people became rather insensitive and didn't even bother to say "excuse me" when they kicked, bumped, elbowed, or tramped upon a victim. Others reported inordinate apologies if such things occurred. Some even reported both trends with some puzzlement. One guess as to what was occurring is that shelter living requires development of a new folkway. More moving out of the way and bumping is necessarily involved than is true of most situations except for temporary situations such as crowded public transportation, elevators, and cocktail parties. Consequently, shelterees eventually develop a new level of tolerance which does not require all of the social amenities for normal movement in the shelter. On the other hand, it becomes very important to most shelterees to adjust to the situation and keep group conflict to a minimum. If a person moving about the shelter perceives that he may be annoying others or creating a possible source of conflict, he may over-warn or over-apologize to keep conflict to a minimum. If this is the case, the apparent paradox may be the result of difficulty in differentiating what is normally to be expected as a result of movement in a crowded shelter from possible sources of conflict. Wide individual differences in sensitivity to such situations make the apparent paradox even greater.

## OVERCROWDING

Eleven adults joined the 30 shelterees for the last 20 hours of the two week test (Group IV). This allowed slightly less than six square feet of floor space per person. No attempt was made to perform a formal analysis of crowding with the 41 persons in the shelter. However, informal reactions to the crowding were obtained through discussion with shelterees and by a project staff member who was one of the additional shelterees. In general:

- Newcomers were surprised at the ease with which they were accommodated (They had all previously observed the shelter with 30 occupants through the one-way screens.
- Newcomers reported that crowding seemed to be reduced after about the first hour in the shelter.
- Crowding during the day was much less of a problem than at night, due to the fact that all of the bunks were erected and occupied most of the floor

Figure 4. Breakfast with 41 Shelterees
(photograph taken through a one-way vision screen.)

space without providing comfortable sleeping space for all shelterees.

- It was felt that the amount of crowding experienced in this situation could easily have been tolerated for two or three days. It was also felt that, if necessary, it could have been tolerated for the full two weeks. The photograph presented in Figure 4 indicates that the minimum mobility required for meal service was possible with 41 persons in the shelter.
- It was difficult to estimate just how much more crowding could have been tolerated for periods up to several days. The estimates indicated that five to 10 more persons could have been accommodated without breakdown of shelter management.

An attempt was made to sleep 41 persons at once on the 30 bunks (two persons were on watch during the night). The plan view of the arrangement of three tier bunks is shown in Figure 5. This sleeping arrangement was worked out by the shelterees.

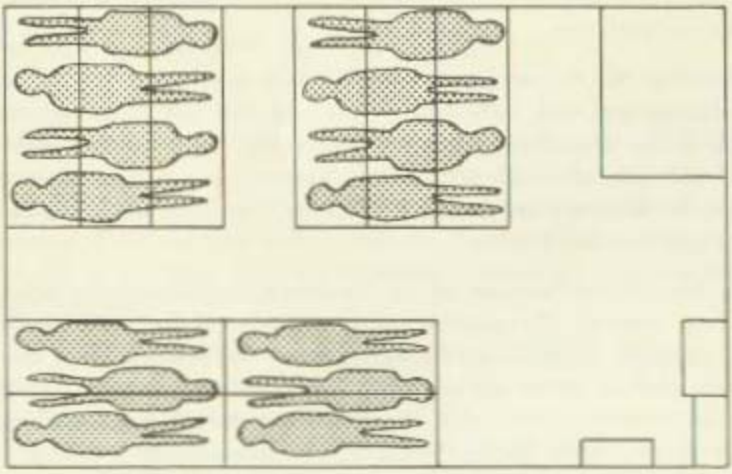

Figure 5. Bunking Arrangement to Sleep Up to 42 Persons with 30 Bunks.

The general consensus after a night's experience with sleeping 41 persons on 30 bunks was that shift sleeping would have been preferable.

## CONCLUSIONS CONCERNING SPACE

The amount of space available to shelterees in this study, eight square and 58 cubic feet per person, is adequate for good individual adjustment and a high level of group organization and morale. This assumes a high degree of flexibility in converting three-tiered bunking space into sitting and recreation space. This includes storage, food preparation, and lavatory space, but does not include space for ventilation and auxiliary power equipment.

By comparison, the *Guide for Executives*, NP-10-1, Office of Civil and Defense Mobilization, October 1959, recommends a minimum of 12 square feet per

person in a well-ventilated shelter. *The Guide for Architects and Engineers, NP-10-2, Office of Civil and Defense Mobilization, May 1960,* recommends 10 square feet per occupant if triple-tiered bunks are provided with two square feet additional space for storage. *The Office of Civil and Defense Mobilization Advisory Bulletin No. 243. Inculsion of Fallout Shelters in Buildings, August 24, 1959* states that shelters shall provide 10 square feet of net floor area and 65 cubic feet of net volume per occupant. Additional space shall be provided for fixed equipment, sanitary facilities, storage, and service areas.

The Naval Radiological Defense Laboratory 100-man shelter allowed 12 square feet gross and 117 cubic feet gross per occupant (Strope, et al, October 1959) during its two week occupancy test. Goldbeck and Newman (1960) suggest that capacity of the shelter could be increased from 50 to 100 per cent without imposing any serious hardships if suitable modification of the internal design of the shelter were made.

The "idealized" group shelter recommended by Dunlap and Associates (*Procedures for Managing Large Fallout Shelters*) includes 9 square feet and 81 cubic feet per occupant.

Results of the current study suggest that less space is required for good shelter management and individual adjustment than previous American work has indicated. It is beyond the scope of this study to gage the additional health hazards from reduced space allotments; however, any reduction of space must, of course, be accompanied by provisions for providing each shelteree with adequate ventilation at all times.

Miss Asa Brand-Persson of the Research Institute of National Defense of Sweden has reported (*Symposium on Environmental Engineering in Protective Shelters, National Academy of Sciences, 8 and 9 February 1960)* the use of five square feet of floor space per occupant for occupancy tests of 12 hours or less. This provided sitting space only. However, for possible continuous occupancy of up to two weeks, Miss Brand-Persson has recommended a design objective of about 10 or 11 square feet per occupant.

Studies of the West German Federal Civil Defense Agency (*Air Raid Shelter Manning Test)* have indicated that about 3.5 square feet per occupant is not generally adequate for occupancy beyond about one day. A five day occupancy test was conducted by the West German Federal Civil Defense Agency with about 5.5 feet provided per occupant. Bunks were provided for only one-third of the occupants. Only healthy males between 16 and 47 years of age participated in the test.

In the German test, despite the fact that a highly selected "ideal" sample of subjects was used, two serious problems occurred as a result of the crowding and "hot bunking:"

- Great difficulty was experienced in shielding the "bunk" area from the "day room" noises. Many occupants reported difficulty in sleeping because of this.

- A considerable jam was created at the doorway between the two areas each time bunking shifts changed despite rigorous discipline of the participants.

The general conclusion concerning space in the German shelter appeared to be that it was adequate, but only in the most minimum sense. It is quite likely that more serious difficulty would be experienced with an unselected sample of occupants.

On the basis of information available from this study and other sources it would appear that:

- With appropriately designed triple-tier bunks, space required per occupant of a well-ventilated shelter can be as low as eight square and 58 cubic feet per person (including storage, lavatory, and service area) without appreciable detriment to effective shelter management.
- A slight increase in efficiency might be obtained, particularly in reducing floor space, by four- or five-tier bunking. Negative factors to be considered in such bunking include:

  1. Possible loss in flexibility of positioning bunks.
  2. An increase in the amount of time occupants might have to remain in bunks.
  3. An increase in floor to ceiling temperature gradient with higher ceilings.
  4. Possible problems with the structural strength of stanchions as the number of bunks per unit increases. In the current study, some difficulty was experienced in preventing three-tier, free-standing bunks from wiggling.

- If a decrease in size below eight square and 58 cubic feet per occupant is highly desirable, a better solution than separate "sleep" and "day" rooms might be a design similar to the one used in this study, but with modified "hot bunking." There might be two-thirds as many bunks as occupants, with the total group divided into three sleeping groups and sleeping scheduled as shown in Figure 6. Groups might rotate schedules from night to night. This will increase management problems because of the necessity for keeping those who are up quiet while others are sleeping. Even under the conditions of this study in which bunks were provided for all shelterees simultaneously, maintaining quiet for sleeping was a significant problem. It may, however, be a much more desirable solution than round-the-clock hot bunking. This concept was not tested during this study and should be so tested prior to formal adoption. This modified hot bunking arrangement might also be evaluated in conjunction with provisions for a separate day room.

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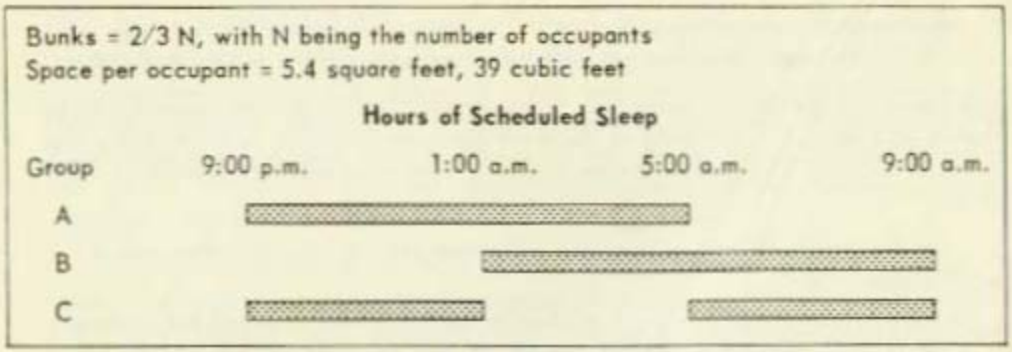


Figure 6. Possible Partial Hot Bunking Schedule to Increase Shelter Capacity.

# CHAPTER 4.
# THE EFFECT OF TEMPERATURE ON SHELTER BEHAVIOR

## TEMPERATURE CONDITIONS

Since the maintenance of a comfortable temperature in a crowded shelter might not be feasible throughout a prolonged period of occupancy, it was felt desirable to investigate the relationship between shelter temperature and shelter behavior. The volume of fresh air which can be circulated in a group shelter will be limited by the filtering capacity of the ventilation system, and the use of air conditioning facilities will be limited by economic considerations and power availabilities. The latent and sensible heat emitted by the shelterees together with the heat generated by lighting and heating of food will tend to raise the temperature and humidity to uncomfortable or even unbearable levels. Although it is not a purpose of this study to define the level of physiological intolerability, it seemed worthwhile to investigate the effect of uncomfortable temperatures on shelter adjustment.

In the four experimental groups the air supply to the shelter approximated the OCDM minimum specifications *(OCDM Advisory Bulletin No. 243, dated August 24, 1959)* of 3 cubic feet per minute per person of fresh air and 12 cubic feet per minute per person of recirculated air. The recirculated air was passed through a filter for cigarette smoke and odor removal. The temperature and humidity of the air entering the shelter was controlled by the air conditioning unit to produce the desired effective temperatures within the shelter. Effective temperatures were determined from the wet and dry bulb temperatures within the exhaust duct using the *ASHAE Comfort Chart for Still Air.* The OCDM recommended maximum effective temperature of 85°F *(Guide for Architects and Engineers, NP-10-2, May 1960)* was used as a guide in deciding the shelter temperatures to be used.

The first study in which the shelter temperature was permitted to rise to an appreciable uncomfortable level was Pilot Study D. During both days of this study the effective temperatures ranged from 78°F (81° dry bulb, 76° wet bulb, 80% relative humidity) to 83°F (85° dry bulb, 82° wet bulb, 85% relative humidity) when measured in the shelter exhaust and up to three degrees higher than this when measured at head level within the shelter. This high temperature resulted in profuse perspiration, reduction of activity, and reports of extreme discomfort by the shelterees. Many of them also reported that it was difficult to concentrate and that they had physiological symptoms such as headaches, nausea, and elevated body temperature (each subject took his own oral temperature daily). The discomfort was most noticeable when the ventilation system was entirely shut down. Another factor which probably contributed to the discomfort was the heat

radiated from human bodies in such closed quarters. On the basis of this pilot study it was decided to use somewhat lower maximum effective temperatures in the experimental studies.

In order to compare shelter behavior under relatively comfortable and relatively uncomfortable temperatures two of the experimental groups were subjected to the former conditions, and two to the latter. One group at each temperature level had a pretrained and predesignated leader, whereas the other did not. High temperatures were maintained for Group I and for the first week of Group IV, and relatively comfortable temperatures were maintained for Groups II and III and for the second week of Group IV's occupancy. Groups II and IV had pretrained and predesignated leaders.

The effective temperatures for each of the four groups throughout the experimental periods are plotted in Figure 7. Wet and dry bulb temperatures are shown in figures 8 and 9 respectively. It should be noted that these temperatures were measured in the exhaust duct, and that data from Pilot Study D indicate that the effective temperature at head level within the shelter is as much as three degrees higher. In general, the temperature and humidity of the intake air was held fairly constant throughout any one week, and the fluctuation of the shelter temperature was a function of the activity level of the shelterees and the use of the hot plate. However, the day-to-day temperature variations in Study I were due in part to malfunction of the air conditioning system.

The air supplied to the different groups was approximately as shown in Table IV.

**Table IV. Input Air Temperatures**

| | "Hot" Groups | "Comfortable" Groups |
|---|---|---|
| Wet Bulb Input | 60° F | 50° F |
| Dry Bulb Input | 65° F | 55° F |
| Effective Temperature | 63.5° F | 54° F |

A dry bulb thermometer was mounted inside the shelter for subject's reference.

An indication of the thermal diffusion characteristics of the simulated shelter was obtained for comparison with real shelters. This was done by closing up the unoccupied shelter with a 1650 watt electric heater inside. Readings were taken each half-hour from a remote-reading thermometer having its sensing element mounted on the inside wall of the shelter and a second thermometer mounted outside the shelter in the observer's area. Results are shown in Figure 10.

## EFFECT OF TEMPERATURE

The discomfort resulting from the high temperatures in Study I and the first week of Study IV was indicated not only by the behavior of the shelterees, but

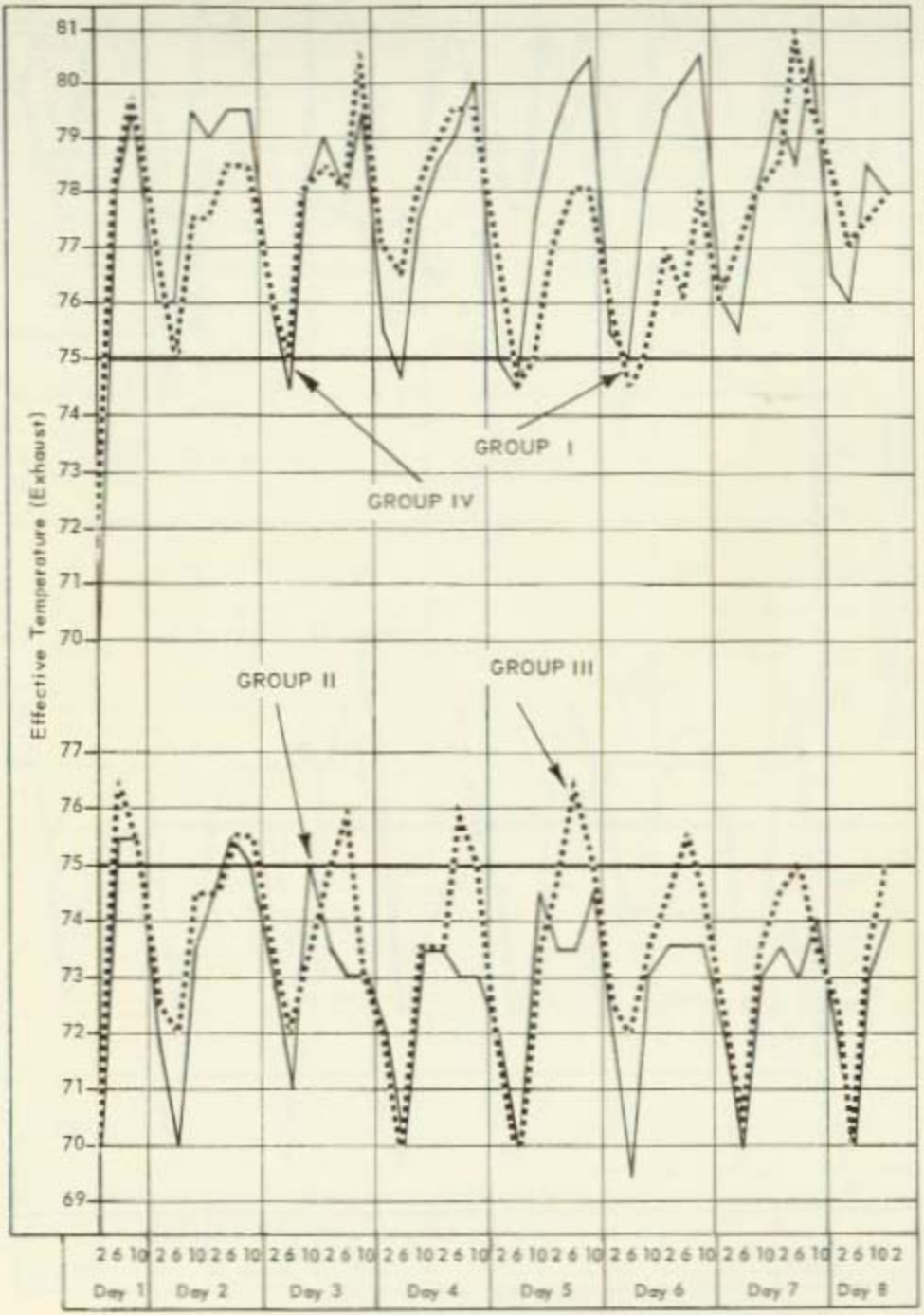


Figure 7. Effective Temperatures Maintained During "Comfortable" (Groups II and III) and "Hot" (Groups I and IV) Conditions

(Note that temperatures at head level were about three degrees higher than the exhaust temperatures plotted in this figure.)

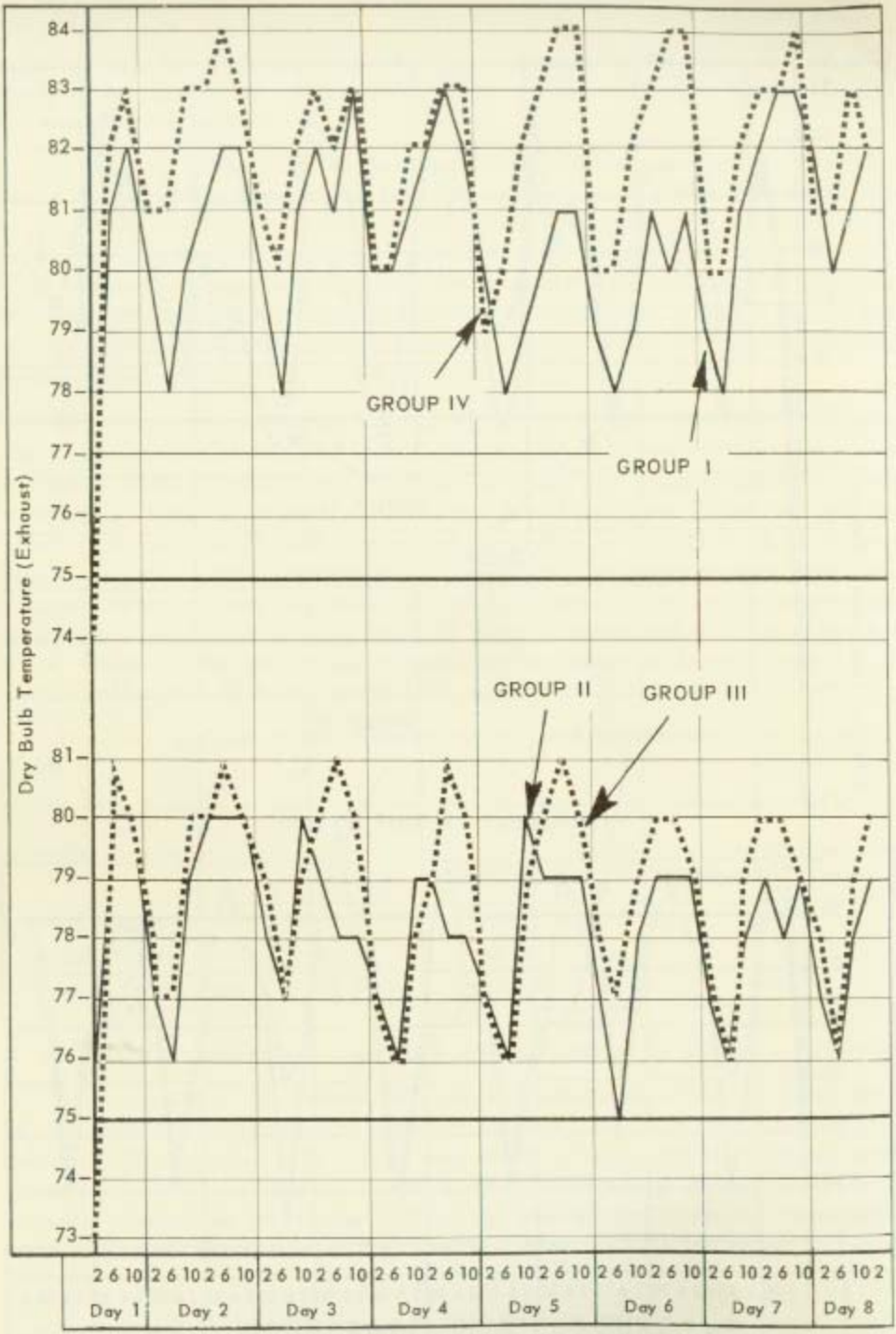


**Figure 8. Dry Bulb Temperatures Maintained During "Comfortable" (Groups II and III) and "Hot" (Groups I and IV) Conditions**

**(NOTE: Temperatures at head level were about three degrees higher than the exhaust temperatures plotted in this figure.)**

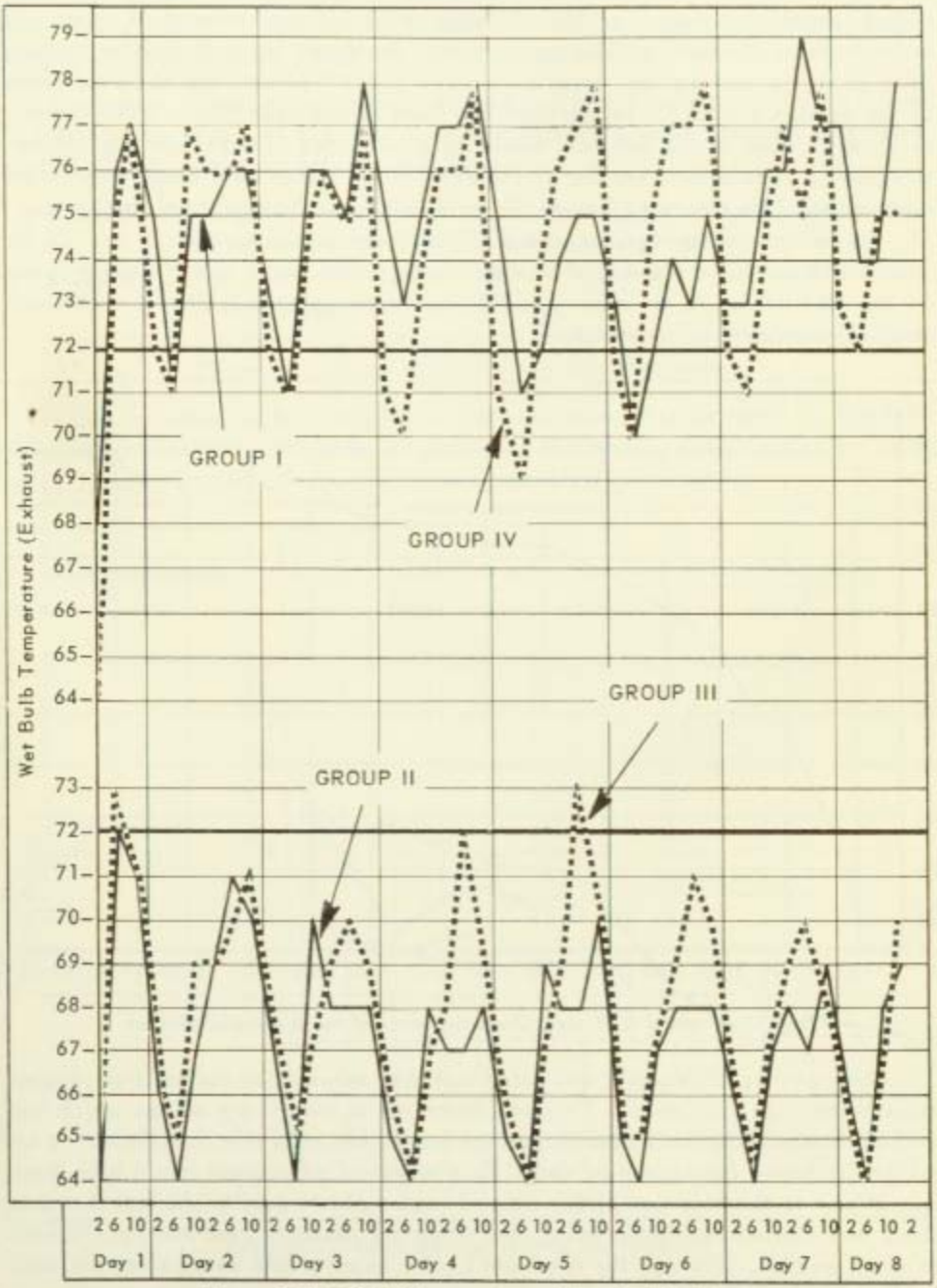


**Figure 9. Wet Bulb Temperatures Maintained During "Comfortable" (Groups II and III) and "Hot" (Groups I and IV) Conditions**

**(NOTE: Temperatures at head level were about three degrees higher than the exhaust temperatures plotted in this figure.)**

also by their subjective reports in the shelter diaries and post-shelter questionnaires. Behavioral responses to high temperature included removal of shirts and undershirts by the men, profuse perspiration, decreased level of activity, turning down of lights, and making verbal complaints about the heat. The observers were of the opinion that if the temperature had been raised even two or three degrees in Study I, some of the subjects would have requested release from the shelter. However, it should be noted that in the daily diary ratings on a seven point scale ranging from "No desire to leave" (1) to "Don't know if I can stand another day" (7), the median rating never exceeded 3.0 until the last day, when it was 3.6 for Group I. However, at the end of a week's stay under "hot" conditions for Group IV the median desire to leave was 1.9, but went up to 2.2 after an additional week of "comfortable" temperature.

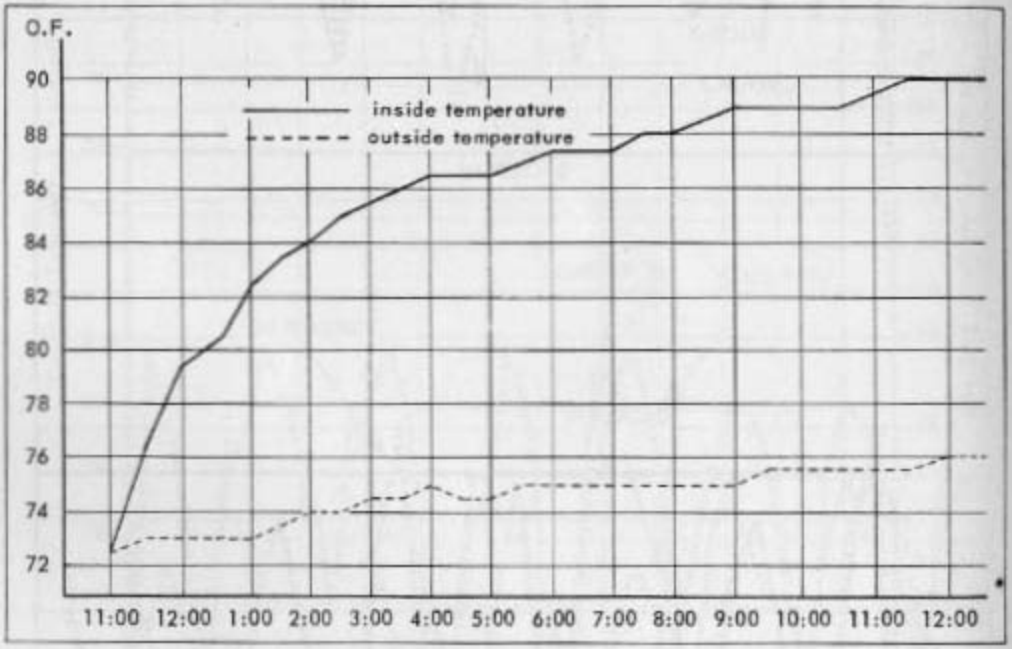


**Figure10. Thermal Diffusion Characteristics of the Simulated Shelter**

Observations of Group IV indicated that they adjusted to the adverse temperature better than did Group I. This was borne out in their diary ratings which had median ratings of heat and humidity which were more favorable than Group I's on six of the seven corresponding days. This improved adjustment could have been due in part to the tone set by the trained leader and in part to the fact that this study was carried out during early June when the subjects were more acclimated to warm weather, although the two weeks prior to entry had been relatively cool for Pittsburgh at that time of year.

Even for Group I, the median ratings of heat and humidity on a scale ranging from "Comfortable" (1) to "Almost unbearable" (7) had a maximum of 4.8 and fell

below 4.0 on two of the days. If these sets of ratings are to be taken at face value they suggest that the average shelteree would have tolerated a higher temperature, although perhaps one or two were approaching their limit.

A summary of daily diary ratings of heat and humidity is presented in Table V. Results are given at the first quartile, second quartile (median) and third quartile. Quartiles may be defined as follows:

- Quartile 1–the point of discomfort below which 25 per cent and above which 75 per cent of the subjects indicated they were.
- Quartile 2–the point of discomfort below which half and above which half of the subjects indicated they were.
- Quartile 3–the point of discomfort below which 75 per cent and above which 25 per cent of the subjects indicated they were.

There appeared to be a slight trend toward being less bothered by the heat after a period of time. However, as shown by the median daily ratings for each day in Figure 11, this trend was neither very marked nor reliable.

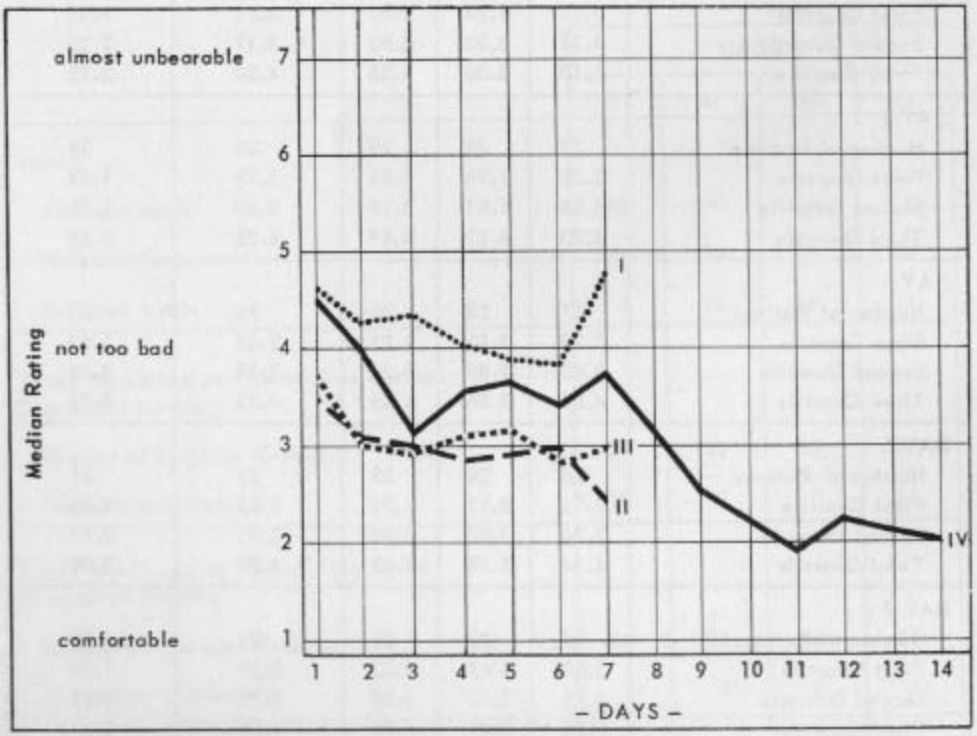


**Figure 11. Diary Ratings – Heat and Humidity**

The post-shelter questionnaire provided another source of information about the reactions to the heat and humidity. Subjects' responses to questions concerning heat and humidity as a discomfort factor are summarized in Table VI. The ranking of whether heat and humidity bothered them "much, "some," or "little,"

## Table V – Summary of Diary Ratings for Heat and Humidity

(1 = comfortable, 4 = not too bad, 7 = almost unbearable)

| | GROUP | | | | |
|---|---|---|---|---|---|
| | I | II | III | IV (1st week) | IV (2nd week) |
| DAY 1 | | | | | |
| Number of Ratings | 26 | 28 | 29 | 26 | 24 |
| First Quartile | 3.90 | 2.25 | 2.56 | 3.88 | 2.00 |
| Second Quartile | 4.60 | 3.50 | 3.79 | 4.55 | 3.17 |
| Third Quartile | 5.50 | 4.38 | 4.58 | 5.30 | 4.33 |
| DAY 2 | | | | | |
| Number of Ratings | 27 | 28 | 29 | 26 | 22 |
| First Quartile | 3.39 | 1.88 | 1.81 | 3.28 | 1.61 |
| Second Quartile | 4.28 | 3.10 | 3.07 | 4.00 | 2.50 |
| Third Quartile | 5.06 | 3.80 | 4.15 | 4.81 | 3.88 |
| DAY 3 | | | | | |
| Number of Ratings | 26 | 28 | 29 | 26 | 24 |
| First Quartile | 3.13 | 1.78 | 1.81 | 2.21 | 1.55 |
| Second Quartile | 4.33 | 3.00 | 2.92 | 3.17 | 2.25 |
| Third Quartile | 5.13 | 4.00 | 4.25 | 4.50 | 3.75 |
| DAY 4 | | | | | |
| Number of Ratings | 27 | 28 | 29 | 26 | 24 |
| First Quartile | 2.55 | 1.78 | 1.91 | 2.83 | 1.43 |
| Second Quartile | 4.05 | 2.83 | 3.10 | 3.60 | 1.86 |
| Third Quartile | 4.73 | 4.22 | 4.69 | 4.25 | 3.25 |
| DAY 5 | | | | | |
| Number of Ratings | 27 | 28 | 29 | 26 | 23 |
| First Quartile | 2.29 | 2.11 | 1.81 | 2.63 | 1.58 |
| Second Quartile | 3.83 | 2.89 | 3.21 | 3.71 | 2.25 |
| Third Quartile | 4.63 | 3.86 | 4.35 | 4.75 | 3.31 |
| DAY 6 | | | | | |
| Number of Ratings | 26 | 28 | 28 | 23 | 21 |
| First Quartile | 1.93 | 2.13 | 1.70 | 2.19 | 1.53 |
| Second Quartile | 2.86 | 3.00 | 2.80 | 3.42 | 2.13 |
| Third Quartile | 4.44 | 3.78 | 4.43 | 4.75 | 3.88 |
| DAY 7 | | | | | |
| Number of Ratings | 24 | 27 | 28 | 22 | 18 |
| First Quartile | 2.50 | 1.61 | 3.33 | 2.38 | 1.50 |
| Second Quartile | 4.75 | 2.42 | 3.00 | 3.75 | 2.00 |
| Third Quartile | 6.00 | 3.81 | 4.20 | 4.64 | 3.50 |
| TOTAL DAYS | | | | | |
| Number of Ratings | 183 | 195 | 201 | 175 | 156 |
| First Quartile | 2.76 | 1.89 | 1.80 | 2.73 | 1.57 |
| Second Quartile | 4.19 | 2.99 | 3.16 | 3.79 | 2.31 |
| Third Quartile | 4.95 | 3.98 | 4.40 | 4.84 | 3.70 |

indicated that subjects in Group I were considerably more bothered by the heat and humidity than were the subjects in other studies. Subjects from Group IV, who had been subjected to the "hot" condition for the first week of their stay seemed either to have forgotten the discomfort or were much less bothered by the heat than were subjects in Study I since they tended to rate heat and humidity discomfort more like Studies II and III than like Group I.

The subjects were asked to nominate five factors causing the most discomfort or difficulty from a list of twenty-one such factors. Although the number of subjects naming heat and humidity as one of the five greatest discomfort factors was greater in both groups I and IV than in either of the "comfortable" groups, again the results for Groups IV were similar more to the comfortable groups than for Group I. The number of subjects naming heat and humidity as either one of the five least discomfort factors or as the biggest problem was too small to permit meaningful comparison of results for individual groups, although they appear to be roughly consistent with the other measures.

**Table VI. Subjects' Post-Shelter Evaluation of Heat and Humidity**

| | GROUP | | | |
|---|---|---|---|---|
| | I | II | III | IV |
| Rating | | | | |
| Bothered Much | 13 | 0 | 2 | 4 |
| Bothered Some | 12 | 13 | 11 | 14 |
| Bothered Little | 4 | 15 | 16 | 11 |
| Times Mentioned as One of Five Greatest Discomfort Factors | | | | |
| Number of Subjects Ranking | 27 | 22 | 28 | 27 |
| Frequency of Mention | 19 | 9 | 10 | 13 |
| Times Mentioned as One of Five Least Discomfort Factors | | | | |
| Number of Subjects Ranking | 25 | 21 | 24 | 26 |
| Frequency of Mention | 0 | 3 | 2 | 3 |
| Number of Subjects Naming as Biggest Shelter Problem | 2 | 0 | 1 | 0 |

As described in Chapter 7, heat and humidity was evaluated on the post-shelter questionnaire as being second over-all only to lack of water as a dis-

comfort factor. If only results for Groups I and IV (the "hot" groups) are considered heat and humidity would rank as the greatest discomfort factor.

The number of persons reporting heat as their most unpleasant memory of shelter experience on the *Follow Up Questionnaire* are shown in Table VII.

**Table VII. Reports of Heat as Their Most Unpleasant Shelter Memory**

| | STUDY | | | |
|---|---|---|---|---|
| | I | II | III | IV |
| Number Reporting Least Pleasant Memory | 29 | 23 | 26 | 27 |
| Number Naming Heat | 4 | 2 | 1 | 1 |

## Conclusion

In conclusion, the data from this study support the OCDM specification that the effective temperature should not exceed 85°F. Although there were no severe psychological or social reactions which could be directly attributed to the temperatures maintained in these studies, personal discomfort increased rapidly as the effective temperature approached 85°F. It is the considered opinion of the project staff that the personal effectiveness and shelter organization would be seriously impaired by higher temperatures for a prolonged period. However, the degree of personal and group adjustment under even the hottest conditions of this study were such as to indicate that many occupants might have reached their physiological limits of endurance prior to psychological or social breakdown.

Although there appeared to be some adaptation to high temperatures after the first couple of days, this was neither reliable enough nor of sufficient magnitude to warrant a recommendation to increase the maximum allowable temperature after some period of habitation.

# CHAPTER 5. LEADERSHIP, TRAINING, AND SHELTER PROGRAM

## LEADERSHIP IN EACH GROUP

**Group I**

Mr. Black, a 35 year old unemployed youth director emerged as initial leader of this group. There was substantial passive resistance to his leadership from the first, mostly in the form of ignoring his suggestions, but no actual challenge to the rather authoritarian role he assumed shortly after entry. He had a number of useful ideas concerning group problems such as the need for organization, delegation of responsibility for atmospheric monitoring, and reduced activity during shutdown of the ventilating system.

However, he lost the confidence of the group by insisting on division of the group into three separate sections, each with its own supplies, commander, and responsibility for functioning as a virtually independent unit. It was the general group feeling that this and similar decisions made by Mr. Black were arbitrary and unwise, as indicated in comments overheard on the audio monitor and in post-shelter interviews. Black's suggestion for separate functional groups would have been quite appropriate in many situations and was, in fact, similar to the management structure which was apparently used with considerable success in the Naval Radiological Defense Laboratory test of its 100-man shelter (Strope, et al, 1960). However, most of the shelterees seemed to feel that the size of the group and design of shelter facilities dictated more unitary functioning in this situation.

The arbitrary decisions by Mr. Black were accepted with a great deal of patience by the group. However, some of his personal behavior was highly objectionable. He made suggestive remarks to some of the young women that frightened and disgusted them, and created a strong undercurrent of feeling against Mr. Black. Later similar remarks to some of the older women in the group intensified this feeling.

Black on several occasions attempted to turn the conversation toward civil defense problems and to initiate at least a modest in-shelter training program. However, his manner was so inept and arbitrary, his qualifications so obviously lacking, and his status with the group lowered to such a point, that his suggestions were met with violent disagreement and derision.

During his first three nights in the shelter Black almost did not sleep at all. He did, wanted to do, or participated in practically all shelter work. By the fourth day he was near physical collapse and had developed a number of physical symptoms. He continually talked about someone else taking leadership responsibility, "I've done enough, it's time someone else takes over. I have to sleep."

One of the CONELRAD broadcasts described the symptoms of radiation sickness. Black jumped from his bunk and rushed to the emergency phone to report that he had radiation sickness. He then "dictated" his symptoms for the shelter log in a loud voice "so others will recognize radiation sickness if they get it."

Black started to keep a large screwdriver hidden in his bunk and Mr. Knight, a 33 year old nuclear power technician, started to carry a hammer in his pocket as a potential countermeasure. On the evening of the fifth day Mr. Knight made several emergency phone calls to request instructions concerning the care of the mentally ill. Several of the young men in the shelter were alerted by Mr. Knight in case any violence erupted and physical restraint was required.

During that same night two notes were passed under the shelter door by one of the mothers in the group begging that Mr. Black be removed from the group for the safety of the children.

Early on the morning of the sixth day, Mr. Black was called on the emergency phone and asked to leave the shelter to talk with the project director. At first he refused for fear of "radiation tests" to which he might be subjected, then he consented to leave if three others would come out with him and act as shields, and finally he was convinced to leave the shelter by himself. In a post-shelter interview he indicated that he thought while he was in the shelter he was being "radiated" through the one-way vision screens and that about a half dozen of the shelterees were Institute employees whose job was to make his leadership role difficult. Mr. Black appeared to recover to his pre-shelter level of adjustment within a matter of hours after being removed from the stress of leadership and challenge to this leadership.

Group morale took an obvious turn for the better after Mr. Black was removed. Although Mr. Knight had clearly taken primary leadership during the emergency of Black's breakdown, Mrs. Jones, a 33 year old housewife whose husband was not in the shelter, became the titular leader of the group until completion of the test. Group morale remained at a high level until the last day when anticipation of leaving created a lot of tension.

Mrs. Jones had been Mr. Black's chief deputy and most outspoken critic prior to his removal from the situation. Post-shelter interviewing revealed that Mrs. Jones was quite well liked and reasonably well respected by most members of the group. Principal reservations concerning her were generally vulgar speech, constant references to body processes and toilets, and a tendency to be noisy and active at night when others were trying to sleep. Among Mrs. Jones' major attributes were genuine friendliness, a gentle and effective manner with children, and an obvious concern for the group welfare.

Mr. Knight played a leadership role from the first, but usually a "behind the scenes" one in modifying arbitrary decisions by Mr. Black or Mrs. Jones. He usually spoke to the group as a whole through Mr. Black or Mrs. Jones. It was only during the emergency involving Mr. Black's difficulty that Mr. Knight

emerged clearly as the group leader. Nevertheless, it was he to whom most shelterees took their problems, gripes, and requests for decisions.

Mr. Knight was considered by more than half to be the "real leader" as reported in their post-shelter questionnaires, although Mrs. Jones was identified as the real leader almost an equal number of times. Post-shelter interviews revealed that Mr. Knight was uniformly liked and respected by other shelterees, including Mrs. Jones. There was, however, considerable feeling that he should have played a more aggressive leadership role. This feeling was apparently shared to at least some extent by his wife, who was interviewed at the same time as he and who took him to task for not having stopped teenage petting (discussed in more detail in Chapter 12) which she felt was quite inappropriate in a public shelter.

**Group II**

Group II had Mr. Craig, a 34 year old professional civil defense instructor, as designated manager and two designated deputies, Mr. Syle and Miss Curry. Mr. Syle was a 31 year old real estate salesman who had previously been a secondary school history teacher. Miss Curry was a 41 year old disaster research worker. All of these persons had a brief orientation to the project and an opportunity to study the experimental management program prior to shelter entry.

Mr. Craig's assumption of leadership was accepted without incident and was not challenged either actively or passively during the week's stay. Group cooperation and morale were high throughout the study. Mr. Syle did not play an active leadership role in the shelter. This was despite numerous attempts by Mr. Craig to provide an opportunity for him to participate as an instructor for selected parts of civil defense training and to participate as part of the leadership group in making decisions. Mr. Syle seemed to adjust well to the shelter situation, was well liked by fellow shelterees, reported that he found the experience to be a most rewarding one, and made several helpful suggestions for shelter design and management in his post-shelter interview. He simply seemed to be unwilling or unable to accept a dynamic leadership role.

Miss Curry, on the other hand, played a very useful leadership role. She led most of the formal discussions concerning in-shelter adjustment problems and techniques for maximizing in-shelter group effectiveness. She was confidante and counselor for many of the shelterees, particularly the girls and women. Mr. Craig relied heavily on Miss Curry in making management decisions and in formulating problems for group discussion and solution.

In general, Mr. Craig and Miss Curry followed a pre-planned shelter program with a number of expansions and deviations to suit special situations and interests of the group. The desirability of making such deviations had been agreed upon prior to the test.

Post-shelter interviewers were unable to obtain any derogatory comments or detect any negative feelings toward either Mr. Craig or Miss Curry, even though

most interviewees were quite candid about making critical comments concerning their fellow shelterees and shelter facilities.

**Group III**

Mr. Boyd, a 22 year old Air Force airman on leave, was elected leader of Group III shortly after shelter entry. The democratic process by which this election took place was apparently not entirely clear to some of the shelterees since even at the end of the test a number of them still thought Mr. Boyd had been designated as manager by the project staff.

Mr. Boyd's approach was rather authoritarian in contrast with the "guided democracy" practiced in Groups II and IV and the relative anarchy of Group I. In general, Mr. Boyd avoided group discussions except when there was obvious conflict between his point of view and the opinions of others in the group. He did however, delegate responsibility and was generally quite effective in his interactions with other people.

Although there was a fair amount of grumbling about Mr. Boyd's desire to save amounts of water and food for beyond the expected period of occupancy, Mr. Boyd's leadership was generally unchallenged. Group cooperation and morale were high. Only one young man challenged his leadership on numerous occasions. He was supported in this challenge on the matter of bedtime by a young woman, Miss Brown. Both had very low status in the group as a whole and received little or no group support on this or other matters.

Much of Mr. Boyd's success as a manager appeared to be due to the presence of two women who acted as his deputies. Mrs. Hatfield was a 41 year old housewife who maintained rapport between the older people in the shelter and management. Miss Bremmin was a 22 year old registered nurse who provided a similar link with the young women in the group. Mr. Krump, a 46 year old unemployed laborer, and Mr. Carlos, a 33 year old professional gambler were Mr. Boyd's primary male deputies.

These informal deputies played a particularly important role in this group since substantial social distance arose between Mr. Boyd and most of the rest of the group. During periods of recreation Mr. Boyd frequently seemed to be "left out," even though he would move from one small group to another. This was not because he was disliked, for most of the people in the group seemed genuinely to like him. Apparently, however, his generally authoritarian approach had established a barrier between him and the rest of the group. This was in marked contrast with the experience of the trained and designated managers in Studies II and IV who found that even the usual barriers between managers and managed did not hold in the close confines of the simulated shelter. In these groups, cooperation was based on respect for superior knowledge concerning the problem at hand and realization of the need for someone to fulfill the management function. Artificial social distance was not required for smooth management functioning.

The matter of social distance and group status was one which caused Mr. Boyd difficulty. In an apparent attempt to gain group status, Mr. Boyd talked frequently and at length about his experiences in the Korean conflict, despite the fact that he was in high school and not in Korea at the time hostilities were terminated. Regardless of any ethical considerations, this was a fairly dangerous practice for maintaining his group status since a person who had knowledge concerning the Korean conflict could easily have broken his story. Mr. Steele, a 21 year old unemployed machinist and Mr. Boyd's chief antagonist, had some military training and caught Mr. Boyd in several minor discrepancies, although not enough to dispute the entire story. One of the observers on the research staff was a fighter-bomber pilot in the Korean conflict who immediately identified that the stories could not be true. Had he or someone of similar background been in the shelter, it is probable that Mr. Boyd's status as manager would have been jeopardized. In post-shelter interviewing, Mr. Boyd freely admitted telling stories to maintain group status, but apparently did not see that there was any risk involved. This was evidently not a new technique with Mr. Boyd since he had also given the same misinformation in a pre-shelter interview.

As has been mentioned, one of Mr. Boyd's unofficial deputies was Mr. Carlos, a professional gambler. Increasingly during the course of the week's stay, Mr. Carlos' values seemed to prevail. Although Mr. Boyd was obviously against gambling in the shelter at first he acquiesced to it. When Mr. Carlos had "cleaned out" all of the willing gamblers, he became quite disagreeable until another woman reluctantly joined the game and dutifully lost the seven dollars she had brought with her to the shelter. Mr. Boyd did not intervene. Another incident involved Mr. Boyd's announcement that there would be no Sunday gambling. Mr. Carlos said "no one is going to stop me," and Boyd didn't try. In his post-shelter interview Mr. Boyd indicated that he felt Mr. Carlos was a primary asset to the shelter group because of his help with shelter activities and support of Mr. Boyd's leadership.

Mr. Boyd's general speech pattern would for the most part have been quite acceptable in middle-class American society. His interaction with women in the shelter was friendly, but appropriately reserved. However, when he would join a small group of the men in the shelter his speech would, like theirs, become profane and oriented toward "blood and guts" topics. The significant aspect of this change is that these conversations were necessarily imposed upon the rest of the shelter group because of the crowded conditions. Thus, instead of trying to bring the sub-group up to his standard for the shelter, Mr. Boyd was willing to accept its standard to "be one of the boys."

Post-shelter interviews indicated that, with some exceptions, Mr. Boyd was well liked and highly regarded as a leader by the group. Insofar as could be determined, none of the subjects was aware that Mr. Boyd had misrepresented his age, his role in the Korean conflict, or other matters. His management clearly had less difficulty than the management of Group I, but there were clear signs that the basis for his management was insecure. This might have become more of

a problem under the additional stress of a real emergency or even with an additional week of shelter occupancy.

An example of this insecurity was an episode which occurred at about midway in the shelter stay, concerning observance of a ten o'clock curfew. Loud talking continued until past eleven o'clock and Mr. Boyd lost his temper, got out of bed and called a group meeting. He attempted to get the group to make a decision regarding an appropriate time for retiring. The group, however, failed to reach agreement and after almost an hour of loud arguing, Mr. Boyd returned to bed. No decision had been made. The shelter leader was visibly shaken by the incident, and apparently lost some status with the group.

**Group IV**

Group IV was managed by Mr. March, a 51 year old professional civil defense instructor. His deputy was Mr. Mann, a 21 year old minature golf course operator who had been a well adjusted and effective "follower" in Group I. Mr. Mann was the only person to participate in more than one experimental group. The major purpose in his Group IV participation was to obtain comparative data from a "first-hand" source.

Mr. March had no difficulty in assuming leadership during the first few minutes of the shelter stay. There was no hint of challenge to his leadership during the two-week stay. Mr. March followed the pre-planned program fairly closely for about the first week. For the second week, he followed roughly the same type of daily routine but used group solution of post-evacuation problems rather than formal training. During the early part of the second week he had the entire group work on the problem. Later he split the group into sub-groups. Each sub-group studied a different problem and then reported back to the larger group. Each sub-group report was then discussed by the entire group.

Although Mr. Mann had been an effective follower, he did not fill a significant management role. He realized he was not filling his assigned role and temporarily took on the role of "planned agitator" to maintain status until Mr. March recognized what was occurring and told him he was clearly *not* there to cause trouble. From that point on he played a follower role, with minimum leadership responsibility.

Mr. Braun, a 40 year old security guard, emerged as Mr. March's principal deputy. Mr. Braun had been an active civil defense volunteer for many years. Mr. March and Mr. Braun operated as an effective team with almost no conflict between them or with the rest of the group.

Post-shelter interviews identified no negative feelings on the part of the group toward Mr. March. He was, quite possibly, the best liked and genuinely respected participant from any of the groups. Even those whom he had to remind about keeping shelter rules had what appeared to be a genuine respect and liking for him.

## ROLE OF THE SHELTER MANAGER

No attempt will be made here to enumerate all of the tasks an effective manager must perform. This problem has been exhaustively studied by Dunlap and Associates (April 1960).

Here, only those functions which made an obvious difference between management success and failure will be outlined.

**Assuming Leadership**

A manager had assumed command of each of the four groups within an hour of shelter entry. This leadership started to emerge almost immediately upon shelter entry. The designated leaders for Groups II and IV had assumed control of the situation within minutes of entering the shelter. Even though subjects had not met the designated leader prior to shelter entry, there was no challenge or question of the legitimacy of their leadership.

The only person whose assumption of leadership was seriously challenged was Mr. Black from Group I when he showed an inability to deal with shelter problems and was having difficulty with his own personal adjustment. There was some minor direct challenge of Mr. Boyd's authority on the matter of keeping quiet after lights out. Mr. Boyd also apparently lowered his standards for shelter conduct in order to be accepted by a sub-group in the shelter.

**Providing a Basis for Authority**

The designated managers did not use themselves as authority figures. Rather they drew their authority from:

- What "civil defense" or "government" would want to be done in a situation of the type being faced.
- Agreements which the group had already made concerning rules, but which were forgotten or ignored at times.
- What was clearly for the good of the group, even though it might be contrary to the preferences of some shelterees.

If a matter had to be decided on the basis of individual opinion in lieu of any clear objective criteria, the designated leaders almost always opened the matter for group discussion and decision. Thus, they objectified the management role and disassociated it from their own personal preferences and opinions.

In contrast, the emergent leaders tended to personalize the management role by confusing what was clearly best from the civilian defense point of view, what was personal opinion, what was simple execution of rules democratically arrived at, and what was for group good even though it might conflict with individual comfort. The emergent leaders, therefore, tended to become more involved with personal contention with other members of the group than did designated leaders.

**Delegating Responsibility**

Both of the designated leaders and Mr. Boyd from Group III delegated quite a lot of responsibility. Mr. Black from Group I tried to do almost everything himself. Mr. Knight and Mrs. Jones tended to start doing a needed piece of work and wait for others to come forward to assist. The end result with Group I was not too different but it took much longer for an orderly routine to emerge.

Both of the designated managers had a deputy who was unwilling or unable to fulfill many of his assigned functions. Mr. Craig simply divided the added responsibility between himself and his other designated deputy. Mr. March, who had only the one assigned deputy, gradually assigned an increasing amount of responsibility to Mr. Braun, a person from the group who demonstrated ability to perform a number of useful managerial functions. Both designated managers were non-punitive about their deputies' failure and did all they could to avoid their deputies' "loss of face."

Mr. Boyd was faced with a similar, though less serious, problem in Group III. The elected deputy was Mrs. Hatfield. It soon became clear, however, that major responsibilities were being assumed by a nurse, Miss Bremmin, who had been appointed by Mr. Boyd to be in charge of cooking. She was not aggressive and did not appear to seek a management role, but gradually her nursing care of the shelterees and cooking duties were supplemented by playing an active role in all areas of shelter life. Mr. Boyd discussed most management problems with her and appeared to depend heavily upon her advice. Mrs. Hatfield continued officially as deputy and served a useful, though limited, role.

In all, it would appear that Mr. Black's attempts to carry an excessive amount of responsibility himself and his attempt to designate independently operating sections were the only serious errors in delegating responsibility.

**Interpreting Civil Defense Information**

Many occasions arose in the shelter experience where it was necessary to interpret civil defense information in order to plan garbage disposal, predict time of evacuation, assess the overall damage situation, etc. In general the emergent leaders had no more background for doing this than the rest of the shelterees. Many of the CONELRAD messages and civil defense publications were therefore not understood or misinterpreted.

The designated managers, on the other hand, were not only able to lend interpretations to the civil defense information but were also able to expand and supplement it. This ability to interpret civil defense information appeared to be very helpful in authenticating their right to lead and permitting them to designate responsibility without threat to their own position.

**Mediating Disagreements and Disputes**

There was not a great deal of overt hostility or aggression in any of the groups. However, as might be expected, the managers were involved in a dis-

proportionate amount of it in executing their appropriate functions. In the groups having a designated leader, less of the disagreement involved shelter management, and was almost entirely limited to personal disputes. The designated managers, therefore, were more involved as umpires or sympathetic listeners to both sides than as participants in disputes. In general, designated managers avoided minor disputes entirely unless they were asked to mediate. Even when designated managers had to remind the shelterees about rule infractions, they were usually not hostile about it and met with good cooperation and no apparent hostility.

On the other hand, emergent leaders were more frequently involved in disputes concerning appropriate paths of action and interpretation of rules. Contributing factors seemed to be a lack of perceptiveness of the groups felt needs and uncertainty on the part of emergent leaders as to their appropriate role in formulating plans for the group and acting as the spokesman for the group.

**Counseling**

Shelterees frequently confided their personal problems to managers. Principal exceptions to this were Mr. Black who had obvious personal problems of his own and Mr. Boyd who was not very approachable due to the rather authoritarian management of his group. Miss Bremmin was confided in to a considerable extent, however.

This function was probably a very important one in ameliorating problems that might otherwise have become serious. Because the counseling function was generally carried out in strictest confidence, it was difficult to identify the content of problems. Some of the problems known to be discussed were sleeping difficulty, sexual tensions, hostility toward other shelterees, claustrophobic reactions, depression, and vocational plans.

**Maintaining Standards**

This is a very critical function which designated leaders did quite well and with which emergent leaders had a great deal of difficulty. Both of the designated leaders established early the general view that all of the good manners and high standards of conduct which ordinarily apply in public apply in public fallout shelters. If anything, even higher standards apply because of the proximity of children and others who might be disturbed by deviation from the most scrupulous standards of conduct. Few situations arose in Groups II and IV to require more specific interpretation of this view.

In Group I, teenage petting caused serious conflict of standards among members of the group but was not actively discouraged by shelter leaders. In Group III, petting was a less serious problem but gambling was an additional problem that was never challenged by the shelter manager. Vulgar language was prevalent among some sub-groups in both groups I and III, practically non-existent in groups with designated managers.

**Maintaining Religious Values**

There was strong feeling among the groups having designated leaders that religious discussion and practice was a positive factor in maintaining group organization, a view shared by the one avowed atheist in Group II. There was substantially more organized religious activity in the form of prayers before meals and more elaborate Sunday services in the two groups having designated managers than in the other two groups. This seemed to be a clear asset to maintenance of scrupulous moral and ethical standards without the manager having to play an authoritarian role. Both of the designated managers delegated formal religious functions to someone else, but actively supported the religious activity. Religious activity in Group III was limited to a brief Sunday morning worship service which Mr. Boyd was coerced into leading.

Mr. Black voluntarily led Group I in a Sunday service which was highlighted by his impassioned sermon which begged God's mercy for mankind. The impact of this sermon for high ethical and moral standards in the shelter may have been attenuated by Mr. Black's penchant for making suggestive remarks to women in the group. This event serves to emphasize that, perhaps more than in almost any other situation, a shelter leader must play a consistent social role if he is to be effective. Unlike the relative ease with which one can play a variety of inconsistent roles in modern urban American society, a shelter manager's life in the shelter must be highly integrated and consistent since he can hardly disassociate his activities in these close confines.

**Maintaining Schedules**

Group III (emergent leadership) most rigidly adhered to a daily schedule. Group I (emergent leadership) was most casual about daily routines. Groups II and IV (designated leaders) generally followed a regular routine, but deviated rather freely if the group seemed to prefer it. Even the relative lack of schedule for Group I seemed to have no particularly undesirable effect except that some of the people who stayed awake at night and disturbed those trying to sleep caught up on their sleep during the day. On the other hand, some variation of schedules seemed to provide desirable relief from the routine.

A much more critical requirement for the manager than adherence to schedules was an accurate perception of the group's needs and wishes and modification of schedule to fit the need.

## IN-SHELTER TRAINING

The purpose of including planned in-shelter training for groups having a designated leader was to determine whether it was feasible and effective. There was no formal training and relatively little discussion of civil defense problems in the groups with emergent leadership, even though they had substantially the same civil defense literature (with the exception of a summary manual prepared

especially for designated managers) in the shelter as did the groups with designated leaders. Whether there would be more serious attention to in-shelter and post-shelter survival problems in a real situation is a moot question.

**Acceptance**

The general acceptance of in-shelter training was quite good. Many of the participants in groups having this training described it as being a most valuable part of their experience. Many also indicated that it helped time to pass more quickly. There was active participation by many shelterees in the training. The amount of attention to lectures and participation in discussion was particularly surprising during the week of training under "hot" conditions for Group IV.

There was never any identifiable attempt to circumvent or discourage the training. In both Groups II and IV the duration and scope of training was expanded beyond plans. The conduct of training also appeared to help designated leaders to validate their right to lead.

**Effectiveness**

Subjects were administered a specially constructed test relating to general content of the in-shelter training both before and after the shelter experience. Two forms of the test were prepared. Half of the subjects were given one form prior to the shelter habitation, half the other. Each subject was administered the alternate form from the one he had already taken after the shelter experience.

Test results are shown in Table VIII. Difference scores were obtained by subtracting each subject's pre-shelter test score from his post-shelter test score.

**Table VIII. Difference Between Pre-Shelter and Civil Defense Information**

| | Groups With Designated Manager | Groups Without Designated Manager |
|---|---|---|
| Number of Subjects Taking Both Pre- and Post-Tests | 43 | 45 |
| Mean Difference Between Post- and Pre-Scores | 8.14 | 1.27 |
| Standard Deviation of Difference Scores | 7.51 | 10.29 |

On a chance basis, the groups receiving training would have shown this much more improvement than the other groups less than one time in a thousand. It is thus clear that the shelterees did learn from the training.

Mr. Mann, who participated in both Groups I (without training) and II (with training) felt that he had higher relative status and had developed much closer personal relations in Group I. Yet, he volunteered the view that he would much rather have met a post-attack situation with Group IV than with Group I.

**Training Techniques**

Although it was one of the purposes of this study to determine whether or not training was feasible under shelter conditions, it was not within the scope of this study to evaluate particular training content or techniques. However, the following informal evaluation is based on results with the training conducted in this study:

- ***Lecture.*** Highly desirable early in the shelter stay to enhance the manager's reputation in the group as a person who is knowledgeable about civil defense problems. Otherwise to be kept to a minimum here because of the frequent reports from shelterees of difficulty in concentrating and short attention span.
- ***Discussion.*** Useful primarily after shelterees have learned relevant basic facts from manuals, lecture, or otherwise. Discussion was quite popular, but required close monitoring by the manager at times to keep it from dwelling on irrelevance.
- ***Assignment of Problems.*** This was a technique used to particularly good effect by Mr. March during Group IV's second week of their stay. This, like discussion, probably would have been less effective if participants had not first been given a substantial core of relevant information prior to group work on problems to be solved in a post-attack situation. The shelter leader must be sensitive to the feelings of individuals who suffer "stage fright" in reporting results to the group.
- ***Amplification of Conelrad Messages.*** Mr. Craig very frequently modified his training or interrupted other phases of the shelter program to clarify and amplify recent CONELRAD messages. This seemed to be a most effective technique for capitalizing on the inherent interest of these messages. Broadcasts of CONELRAD messages were also used as a vehicle for initiating formal training sessions. It requires a considerable fund of accurate knowledge in order to be able to amplify CONELRAD messages effectively. However, Mr. Craig, was able to use this technique effectively even though he had no prior knowledge of CONELRAD message content.
- ***Visual Aids.*** The only training aid used in this study other than manuals was a map and a small, inexpensive chalkboard. No more elaborate visual aids seem to be warranted. Old newspaper and a black crayon could be substituted for the chalkboard if necessary.
- ***Programmed Self-instructional Techniques.*** It was not feasible to prepare self-instructional materials within the scope of this study. This would appear to have considerable promise as practice devices for shelterees, particularly if there is a shortage of highly trained managers. In addition, the inherent interest value of these techniques may provide an antidote to difficulty in concentrating. Such materials would, however, have to take up minimum space and be inexpensive.

**Training Content**

Despite attempts on the part of managers to avoid discussion of pre-attack planning, the realities of the simulated situation still generated substantial interest in this problem. In a real shelter situation, of course, there would be less interest in the planning aspect.

Major content of the training program was concerned with methods for maximizing adjustment to shelter living and methods for coping with the post-shelter world. The study of shelter living logically comes first with greater emphasis on the post-shelter world prior to evacuation.

There was relatively little information available concerning shelter adjustment prior to the study so much of the material on this topic had to be based on the judgment of the project staff. There was a substantial body of information available from civil defense sources concerning planning for the post-shelter situation. However, a major problem was filtering out those aspects of planning that would be most meaningful and useful to private citizens.

The training materials developed and used in this study were intended only as a vehicle for testing the feasibility of in-shelter training. Experience with these materials during the study, however, suggests thay they may provide a reasonable starting point for the development of more formal in-shelter training materials. One problem requiring particular attention is the preparation of guidance material in such a way that the manager can select material of a type and at a level suitable for the particular stay time and attack situation relevant to his shelter.

## EFFECT OF MANAGEMENT ON ATTITUDES

Each subject was given a series of attitude tests prior to and after the shelter experience. These tests were intended to measure attitudes toward:

- ***Civil Defense,*** measured by three different techniques:
  1. a modified Thurstone attitude scale.
  2. a series of adjective ratings.
  3. a projective test which involved an evaluation of subjects' stories concerning pictures of civil defense situations.

- ***Shelters,*** measured by two techniques:
  1. a series of adjective ratings.
  2. a projective test involving subjects' descriptions of how people pictured in a shelter feel.

- ***People,*** measured by a series of adjective ratings.

Alternate forms of all tests except adjective ratings were prepared and administered in a counterbalanced technique similar to the one described for the civil defense information test. The same adjective rating scales were administered to subjects both before and after their shelter experience.

Average changes of attitude are shown separately for groups having a designated leader and no designated leader in Table IX. Mean scores shown in this are difference scores obtained by subtracting pre-shelter from post-shelter scores for each subject. Mean pre-test scores revealed no systematic differences among the groups.

**Table IX. Differences Between Pre-Shelter and Post-Shelter Attitudes**

| | Designated Manager | | | No Designated Manager | | | P |
|---|---|---|---|---|---|---|---|
| Measure | N | M | S | N | M | S | |
| Civil Defense (modified Thurstone) | 43 | 0.22 | 0.58 | 45 | 0.05 | 0.55 | .035 |
| Civil Defense (adjective rating) | 42 | 0.34 | 0.95 | 41 | −0.07 | 1.47 | .069 |
| Civil Defense (pictures) | 39 | 0.79 | 1.42 | 40 | 0.28 | 1.38 | .048 |
| Shelters (adjectives) | 42 | 0.39 | 0.92 | 41 | −0.33 | 1.08 | <.001 |
| Shelters (pictures) | 13 | 5.69 | 21.65 | 18 | −6.55 | 23.28 | .066 |
| People (adjective) | 42 | 0.08 | .867 | 39 | −.397 | 1.04 | .014 |

N, is the number of subjects taking both pre- and post-tests.

M, is the mean (average) difference between pre- and post-tests.

S, is the standard deviation of the difference scores between pre- and post-tests.

P, is the probability that a difference as large as the obtained one in favor of the groups with a designated manager would have occurred by chance.

Although only adjective ratings for shelters show conclusive non-chance results, the uniformity of results for different techniques intended to measure the same attitude strongly suggests that real difference in favor of the groups having a designated manager did occur. These results are particularly impressive when the following factors tending to attenuate the significance of differences between the groups are kept in mind:

- The short "homemade" tests prepared as part of this study would tend to have relatively low reliability, although no attempt was made to obtain reliability estimates.
- The alternate test forms were not statistically equated. This would tend to increase spuriously the estimate of error variance and therefore reduce the seeming significance of difference.

All things considered, it would appear that there is strong evidence that attitudes toward civil defense, shelters, and people in general are more favorably influenced by trained and designated management than by emergent leadership.

All of the techniques used to measure these attitudes show promise for future development to measure attitudes relating to civil defense.

# CHAPTER 6. THE EFFECTS OF SHELTER DESIGN, EQUIPMENT, AND SUPPLIES ON HABITABILITY *

## DESIGN FACTORS

The major consideration in designing the shelter was how to best use the space available.

### Arrangement

The food preparation area, supply shelves and lavatory were located at the front of the shelter. This created some congestion, especially at meal time, but was the most economical use of space. The exhaust fan located, in the lavatory because of its closeness to the cooking area, helped reduce cooking odors and to some small degree reduced the temperature in the kitchen area.

### Lavatory

One lavatory containing a flush toilet was located in a corner at the front of the shelter and proved adequate for 30 people. Only three subjects reported the lavatory facilities as being the biggest problem and only 26 times were lavatory facilities mentioned as being at all bothersome. The overall rank of toilet facilities as a discomfort factor was 15. Since the lavatory was used only 1/3 of the time between 7:00 A.M. and midnight, it does not seem unreasonable to assume that the OCDM (NP-10-1) recommendation of one toilet per 70 people would be sufficient. A summary of toilet usage is presented in Table X.

**Table X. Toilet Use**

(Recorded 7 a.m. to midnight, based on time from entry to egress from the lavatory.)

| | GROUP | | | | |
|---|---|---|---|---|---|
| | I | II | III | IV first week | IV second week |
| Mean Times Used Per Hour | 6.49 | 5.39 | 6.27 | 5.41 | 6.23 |
| Mean Number of Minutes Used Per Time | 2.51 | 3.15 | 3.36 | 2.46 | 3.16 |
| Mean Number of Minutes Used Per Hour | 16.30 | 16.98 | 21.06 | 22.00 | 19.68 |

### Noise

Summary noise readings are given in Table XI for the hours from 8:30 A.M. to 11:30 P.M. The median night reading was about 50 decibels.

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*Occasional reference is made in this chapter to the overall rank of discomfort factors. The ranking of discomfort factors is described in Chapter 7.*

Table XI. Shelter Noise Level

| | GROUP | | | | |
|---|---|---|---|---|---|
| | I | II | III | IV first week | IV second week |
| Number of Readings | 112 | 112 | 112 | 114 | 96 |
| First Quartile (In Decibels) | 51.5 | 47.8 | 52.5 | 56.1 | 55.0 |
| Second Quartile (In Decibels) | 55.5 | 55.4 | 56.2 | 59.1 | 58.3 |
| Third Quartile (In Decibels) | 57.8 | 58.1 | 59.5 | 64.0 | 62.3 |

Noise was ranked seventh as a discomfort factor. Interviews suggested that the source of discomfort was more from talking and movement at night than actual high background noise.

## EQUIPMENT AND SUPPLIES

### Bunks

The bunks used in the shelter were adequate. The bunks were 24 inches x 72 inches. Although sleeping difficulty was mentioned 34 times as one of the greatest discomfort factors, the bunks were mentioned only 11 times. There were seven reports of the bunks being the biggest problem. The overall rank of bunks as a discomfort factor was 17.

Although several suggestions were made concerning bunks hanging on chains from the ceiling or stanchions, the free standing arrangement permitted greater flexibility in arrangement. Partial and complete demountability was very desirable. When a center bunk was removed, there was more than enough room for sitting on the lower bunk (See Figure 12) and when one or more bunks were completely dismantled there was greater floor space for game playing and movement. The flexibility of bunk design was an important factor in maximum utilization of space.

During the day the shelterees dismantled two of the bunks and removed the middle bunks from two or three others.

No one seemed to have any difficulty climbing onto the top bunk. The older people generally did not attempt to get into a top bunk. The children seemed to prefer the top. If the bunks are any higher than three tiered they could be even more dangerous to young children who could fall and seriously hurt themselves.

### Bedding

***Mattresses:*** were placed on each bunk. This enabled the use of smaller bunk frames by permitting subjects to lie over the bunk frame and increased comfort.

***Blankets:*** were placed on each bunk. The blankets were used by some as covers at night even in the hot studies. Subjects slept in their clothes and blankets were rolled into pillows and used as head rests for sleeping and for

reading in bed both during the night and in the daytime. Blankets were also spread on the floor and the subjects sat on them while playing cards and other games on the floor.

*Pads:* made of washable, quilted cotton were placed on each mattress. The mattresses could not be cleaned after each study and the pads were used so that each group would gave a clean surface on which to sleep. Although the pads were used as covers and pillows they are probably not necessary for real shelters.

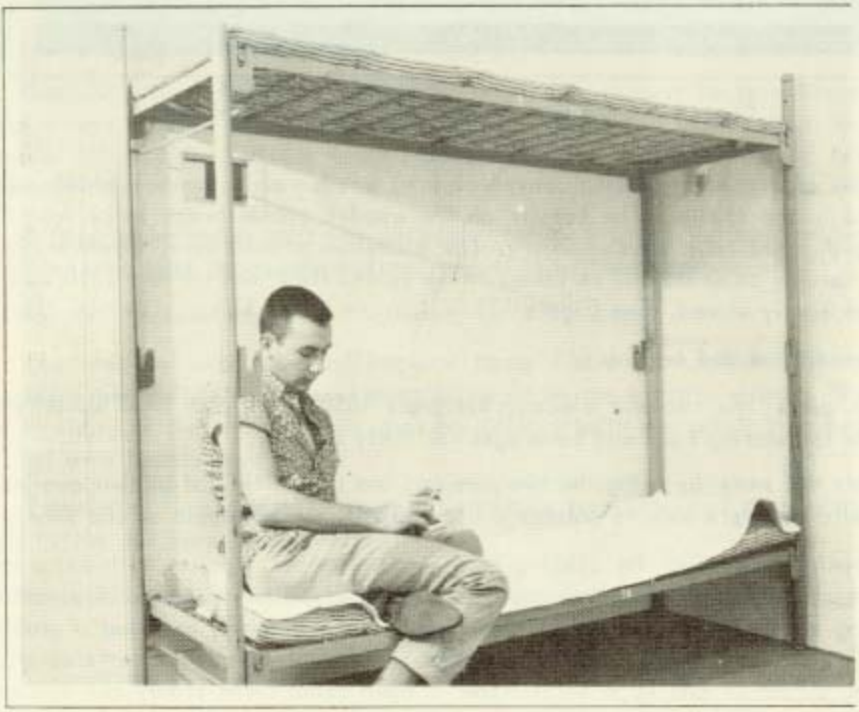

**Figure 12. Three-tier Bunk with Center Bunk Removed**

**Seating Facilities**

*Bunks:* with the center bunk removed (See Figure 12) the bottom bunk served as a bench capable of seating three or four people comfortably.

*Folding chairs:* were the only seats having backs. In the Habitability test of the NRDL 100-man shelter (Goldbeck, R.A. and Newman, P.H., Feb. 1960) there were some complaints concerning lack of seats with backs. Folding chairs would not appear to be essential but would be advisable, especially for the aged and/or infirm. In the current study, the need for seats with backs was substantially reduced because subjects were able to sit on the bottom bunk when the middle bunk was out and lean their back against the wall with a rather high degree of comfort.

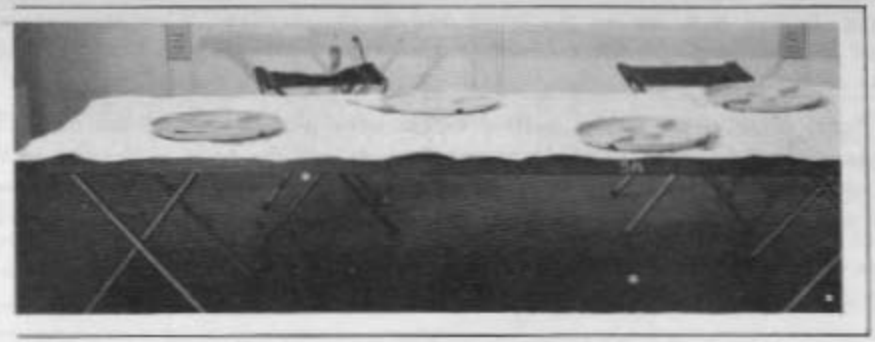

Figure 13. Improvising of Table from Bunk and Two Stools

*Camp stools:* eight folding canvas covered wooden and aluminum stools were provided in the shelter. The canvas on the wooden stools broke loose from the frame and might have caused injury. The aluminum stools were, however, very useful, serving as seats and as tables. When folded they took up very little space and were easily stored. (See Figure 13).

**Food preparation and serving**

*Hot plate:* the two-unit electric hot plate (650 watts and 1000 watts) was adequate for heating food and beverages for thirty people.

*Pots and pans:* by using the two pots and one tea kettle and pitcher available the shelterees were able to prepare a hot meal for all 30 people at one time.

*Cooking utensils:* for stirring food in a large pot, spoons with extra long handles are necessary. For serving, the soup ladle was helpful. The three standard long handled can openers in the shelter broke quickly, creating a problem because almost all of the food was in cans. This was solved, not satisfactorily, by using a hammer and large screwdriver to open cans. Good sturdy can openers, possibly one wall type, are essential.

*Dishes:* the inexpensive hard plastic dishes used in this study were totally inadequate. The heat caused them to crack and by the end of the study not one cup remained intact. The inexpensive soft plastic bowls were adequate, although they discolored easily.

*Tableware:* during the pilot tests plastic tableware was used. This was found to be completely inadequate. The plastic ware broke after one or two uses. Stainless steel forks and spoons were used during the four main studies. These were acceptable, being break resistant and easy to clean.

**Sanitation**

*Broom and dust pan:* were very useful items. The shelter tended to be very dusty and for sanitary and aesthetic reasons cleaning up was very important. Even with frequent cleanup of the shelter, dirt was ranked fifth as a discomfort factor.

***Large synthetic sponges:*** were useful for cleaning and mopping spillage.

***Rubber gloves:*** proved very useful for cleaning the lavatory.

***A divided dish pan:*** did not aid the subjects in washing the dishes. The general comments concerning dish washing suggest that two separate buckets would have been more efficient.

***Non-sudsing detergent:*** is advisable since limited water supply makes rinsing dishes difficult and the suds were an annoyance to the dish washers.

***Polyethylene freezer bags:*** were a very good way of storing garbage. They were sturdy and kept liquid debris from running on the floor.

***One 20 gallon garbage can:*** was adequate but it must be remembered that garbage was ejected from the shelter approximately twice during each week. If disposal of garbage had not been possible one 20 gallon can would not have been sufficient.

***A covered bathroom pail:*** was necessary for disposal of sanitary napkins and would be even more necessary had a chemical toilet been used.

**Medical and Personal Hygiene Facilities**

The medical and personal hygiene items listed in Appendix B were all necessary and much used. One exception might be the electric shaver. The heat and humidity of the shelter made shaving difficult with the result that most men just let their beards grow.

* ***Towelettes:*** a chemically treated disposable towelette was reasonably well liked by the subjects (See Table XII).

**Table XII. Post-Shelter Questionnaire Rating of Towelettes and Dentifrice**

| | Good | Fair | Poor | Total Ratings |
|---|---|---|---|---|
| Towelettes | 42 | 54 | 17 | 113 |
| Dentifrice Tablets | 29 | 52 | 30 | 111 |

The towelettes took the place of soap and water. Most subjects expressed the feeling that cleanliness was a major problem and while chemically-treated towelettes could not take the place of a bath, they were cooling and due to the limited water supply were welcomed as a substitute.

***Dentifrice tablets:*** most people agreed these were adequate for a short period of time. The taste was not too well received but in the absence of tooth brushes and paste they served a definite useful purpose (See Table XII). It might, however, be just as practical and perhaps less expensive to supply each shelteree with an inexpensive toothbrush and salt or baking soda for cleaning teeth.

**Recreational Material**

***Pocket books and magazines:*** were good because they were easy to hold while reading in bed. Because many subjects found it difficult to concentrate in the shelter, magazines with short stories were easier to read and enjoy than lengthy novels.

***Comic books:*** kept the children occupied.

***Playing cards:*** were sufficient although a dozen decks would not have been too many.

***Games:*** were played constantly, with checkers, monopoly and scrabble being the most popular. Several suggestions from subjects were for more group games such as Bingo.

***Modeling clay, coloring books, model airplane sets and crayons:*** were very good time passers. More arts and crafts type material (water colors, beads, etc.) would be useful.

***Pencils, pens and writing paper:*** are essential. Paper and pens were always in demand for score keeping, recording CONELRAD messages, making lists and many other things.

Subjects' responses to the adequacy of recreation facilities are summarized in Table XIII.

**Table XIII. Evaluations of Recreation Facilities**

| | GROUP | | | |
|---|---|---|---|---|
| | I | II | III | IV |
| Good | 14 | 20 | 18 | 18 |
| Fair | 10 | 8 | 9 | 11 |
| Poor | 3 | 0 | 0 | 0 |
| Suggested Specific Additions | 17 | 9 | 0 | 13 |

**Tools and Emergency Equipment**

The tools as listed in Appendix B were useful and necessary. A hammer and a large screwdriver, which might be replaced by a small pry bar, were particularly useful for dismantling and constructing the bunks.

***Fire extinguisher:*** was never needed but some sort of precaution in case of fire is essential. In a recent report (Dunlap and Associates, Inc. 1960) several recommendations were made for fire control in shelters.

**Lighting Equipment**

***Clip on reading lights:*** were very useful. Where power is available they are most desirable for they make it possible for some people who do not want to go to sleep after lights out to read without disturbing anyone.

***Overhead lighting:*** three 200 watt bulbs illuminated the shelter and were controlled by a single two-position switch. The lights could be turned to either bright or dim. The light could never be turned off from within the shelter. This system was arranged to insure adequate illumination for observation at all times. The subjects did not seem to be much bothered by the lights. The shelter should be sufficiently illuminated during sleeping hours to permit easy monitoring by the night watch and easy passage to and from the lavatory (See Table XIV).

Some suggestions were made regarding the use of separate light switches so that the degree of light in a given area of the shelter could be varied at will. In particular, it was felt that a separate light in the kitchen area would have been helpful. The night watch sat in this area and would have liked to have a shaded lamp by which to read.

**Table XIV. Post-Shelter Questionnaire Rating of Day Lights and Night Lights**

| | Bothered Much | Bothered Some | Bothered Little |
|---|---|---|---|
| Day Lights | 6 | 15 | 94 |
| Night Lights | 1 | 20 | 92 |

## Food

The food supplied in the shelter was high in calories, economical, easily prepared and palatable. Special shelter rations were not used in this study because they were not available for general use at the time of the study and the time at which they might become available was not known.

Comments concerning food quantity and palatability on the post-shelter questionnaire are summarized in Table XV.

**Table XV. Post-Shelter Comments Concerning Food**

| | GROUP | | | |
|---|---|---|---|---|
| | I | II | III | IV |
| Food Quantity | | | | |
| Adequate | 27 | 26 | 22 | 24 |
| Inadequate | 1 | 1 | 7 | 4 |
| Food Palatability | | | | |
| Good | 18 | 23 | 13 | 22 |
| Fair | 9 | 4 | 8 | 7 |
| Poor | 0 | 0 | 4 | 0 |

The overall rank of food as a discomfort factor was nine. (It should be noted that the responses in Table XV do not enter into the discomfort ranking, which is based on a set of different measures.

In their daily diaries, subjects rated the adequacy of food on a seven point scale from "very good" to "almost inedible" (7). Results for all days are summarized in Table XVI.

**Table XVI. Ratings of Food in Diaries**

| | GROUP | | | | |
|---|---|---|---|---|---|
| | I | II | III | IV first week | V second week |
| Number of Ratings | 178 | 193 | 199 | 175 | 157 |
| First Quartile | 1.58 | 1.52 | 1.50 | 1.44 | 1.54 |
| Second Quartile (median) | 2.32 | 2.07 | 2.01 | 1.88 | 2.15 |
| Third Quartile | 3.64 | 2.84 | 3.01 | 2.85 | 3.48 |

Subjects also made comments about food in their diaries. Beef stew was most mentioned as the preferred hot food. Overall, the most preferred foods were those which could be eaten cold such as applesauce, fruit cocktail and the beverages. Some suggested foods were powdered eggs and vegetables.

Food was mentioned as the most unpleasant memory by 10 of the 105 subjects naming their most unpleasant memory in a followup questionnaire, and was named by none of the 102 who identified their most pleasant memory.

**Water**

Subjects were informed that they had 210 gallons of water per week for the entire group, or about one gallon per person per day. This was exclusive of water used for toilet flushing. Water utilization by the various groups was as follows:

I. . . . . 181 gal.
II. . . . . 128 gal.
III. . . . . 133 gal.
IV. (first week) . . . . 174 gal.
IV. (second week). . . 143 gal.

Lack of water was overall ranked as the greatest discomfort factor. In written comments concerning water in the post shelter questionnaire, 108 indicated that the amount was adequate and six complained of its being inadequate. No one complained of insufficient water to drink. The lack of water was for bathing. Ten of the 105 subjects indicating their most unpleasant memory on a followup questionnaire named lack of bathing.

# CHAPTER 7. DISCOMFORT FACTORS

## DISCOMFORT FACTORS

Shortly after leaving the shelter, subjects were asked to complete a questionnaire which included an evaluation of 21 potential sources of discomfort. Each potential source of discomfort was evaluated in four ways:

- On a three point rating scale of "bothered much," "bothered some," and "bothered little."
- By being or not being nominated and ranked as one of the five greatest sources of discomfort.
- By being or not being nominated as one of the five least sources of discomfort.
- By being or not being mentioned in response to the open end question, "What do you feel was the biggest problem?"

Results of each of the four types of evaluation and for the total of all four evaluations are shown in Table XVII for each of the discomfort factors. Evaluation results are given as ranks, with the greatest discomfort factor given a rank of one and the least discomfort factor given a rank of 21. Ties were given the mid-scores of the ranks involved. Ranks were computed from the following scores:

- Rating – average (mean) rating where rating points were scored zero for "bothered much", one for "bothered some," and two for "bothered little."
- Greatest discomfort nominations – reciprocal of the number of persons selecting the factor as one of the sources of most discomfort.
- Least discomfort nominations – the number of persons selecting the factors as one of the five sources of least discomfort.
- Biggest problem – reciprocal of the number of persons naming the factor as the biggest shelter problem.
- Total – sum of ranks for the previous four evaluations.

If only results from the two "hot" groups were used, temperature and humidity would rank first for "total," "ratings," and "greatest discomfort nominations."

Although much of the difference between ranks for a given factor on the various evaluation scales is probably due to simple unreliability, some of the difference probably reflects different dimensions of discomfort. Perhaps the outstanding example of this is "lack of exercise." This factor was the greatest discomfort factor according to the rating scale, yet was not mentioned by anyone as being their biggest problem. It would appear that lack of exercise is a factor which bothered most subjects to some degree but was not a paramount annoyance

**Table XVII. Ranking of Discomfort Factors**

| FACTOR | Total Rating R* | N** | M*** | R | "Greatest" Nominations N | R | "Least" Nominations N | R | Biggest Problem N | R |
|---|---|---|---|---|---|---|---|---|---|---|
| Lack of Water | 1 | 116 | 1.11 | 2 | 58 | 1 | 10 | 3.5 | 5 | 6 |
| Temperature & Humidity | 2 | 115 | 1.23 | 3 | 51 | 2 | 8 | 2 | 3 | 9.5 |
| Lack of Exercise | 3 | 114 | 1.10 | 1 | 46 | 3 | 10 | 3.5 | 0 | 20 |
| Crowding | 4 | 114 | 1.46 | 6 | 31 | 5 | 18 | 7.5 | 3 | 9.5 |
| Dirt | 5 | 118 | 1.36 | 4 | 27 | 8.5 | 15 | 5 | 2 | 12.5 |
| Sleeping Difficulty | 6 | 115 | 1.50 | 8.5 | 34 | 4 | 23 | 13 | 6 | 5 |
| Noise | 7 | 114 | 1.50 | 8.5 | 25 | 10 | 21 | 11 | 8 | 3 |
| Physical Symptoms | 8 | 112 | 1.51 | 10 | 29 | 7 | 18 | 7.5 | 1 | 16 |
| Food | 9 | 110 | 1.60 | 11.5 | 18 | 11.5 | 32 | 17 | 10 | 2 |
| Behavior of Others | 10 | 114 | 1.71 | 15 | 27 | 8.5 | 33 | 18 | 17 | 1 |
| Lack of Privacy | 11 | 112 | 1.62 | 13 | 30 | 6 | 21 | 11 | 1 | 16 |
| Concern about Outside | 12 | 119 | 1.40 | 5 | 18 | 11.5 | 24 | 14 | 1 | 16 |
| Inability to Concentrate | 13.5 | 114 | 1.49 | 7 | 14 | 15 | 16 | 6 | 0 | 20 |
| Odors | 13.5 | 116 | 1.60 | 11.5 | 16 | 13.5 | 26 | 16 | 4 | 7 |
| Toilet Facilities | 15 | 113 | 1.74 | 16 | 12 | 16 | 25 | 15 | 3 | 9.5 |
| Bunks | 17 | 113 | 1.78 | 18 | 11 | 17 | 35 | 19 | 7 | 4 |
| Night Lights | 17 | 113 | 1.80 | 20 | 1 | 21 | 0 | 1 | 1 | 16 |
| Boredom | 17 | 114 | 1.70 | 14 | 16 | 13.5 | 47 | 21 | 3 | 9.5 |
| Lack of Organization | 19 | 112 | 1.79 | 19 | 6 | 19 | 19 | 9 | 2 | 12.5 |
| Inadequate Leadership | 20 | 114 | 1.82 | 21 | 7 | 18 | 21 | 11 | 1 | 16 |
| Day Lights | 21 | 115 | 1.75 | 17 | 6 | 20 | 41 | 20 | 0 | 20 |

*R = rank
**N = number of subjects rating the factor
***M = mean rating of the factor

to anyone. In contrast, "behavior of others" was most mentioned (17 times) by subjects as their biggest problem although it was mentioned 33 times as being one of the five least discomforting factors for a rank of 18 and ranked 15 on the basis of ratings. Unlike lack of exercise, the behavior of others did not seem to bother most people, but when a subject was bothered by others he was apparently bothered a great deal.

# CHAPTER 8. BEHAVIOR AS A FUNCTION OF TIME IN THE SHELTER

## RELATION OF SELECTED PARAMETERS TO TIME IN SHELTER

The following parameters revealed no systematic trends as a function of time in shelter:

- ***Sound level readings:*** The sound level readings did not reveal any significant trend from day-to-day. Auditory monitoring did suggest changes in conversational content and size of conversation groups, as described below under phases of shelter adjustment.
- ***Meal time:*** There did not seem to be any particular trend with regard to meal time. Even though specific meal times were set up, the time that meals were served changed from day to day. It did not, however, change in any one direction but fluctuated in a seemingly random fashion.
- ***Bed time:*** Appointed bed times were decided upon by each group. They did not, however, adhere to this schedule. Group III, having a military man as the elected leader, was the most consistent in that they set up the bunks in sleeping position at 10:00 p.m. every night except the last. The other groups, however, were erratic insofar as bed time was concerned so that no specific trends in bed time appeared.
- ***Radiation meter activated:*** Activation of the radiation meter did not seem to follow any definite pattern. The groups having trained leaders activated the meter more often than the groups having an emergent or elected leader. There was a tendency for the number of times the meter was activated to be slightly higher at the beginning of the week. This gives some indication that feelings of anxiety prevailed at the start of the study and diminished as the days passed. This trend could also mean only that the novelty of the meter wore off after the first few days.
- ***Water usage:*** There was no particular pattern to the way in which water was used. Group I and the first week of Group IV (the two weeks having the hot temperature) used more water than the others but all four groups stayed well within the limit of one gallon per person per day.

## SUBJECTS' REPORTS

### Desire To Leave The Shelter

Desire to leave the shelter was rated by subjects in their daily diary on a seven point scale from "no desire to leave" (1) to "don't know if I can stand another day" (7). Results of these ratings are summarized in Table XVIII for each group. Median ratings are also plotted in Figure 14. The general trend in

all groups appeared to be a gradual increase in desire to leave over the period of shelter confinement.

**Table XVIII. Ratings of Desire to Leave**

| | GROUP | | | | |
|---|---|---|---|---|---|
| | I | II | III | IV first week | IV second week |
| Day 1 | | | | | |
| Number of Ratings | 26 | 27 | 29 | 26 | 24 |
| First Quartile | 1.38 | 1.34 | 1.30 | 1.30 | 1.43 |
| Second Quartile | 1.76 | 1.68 | 1.60 | 1.59 | 1.86 |
| Third Quartile | 3.10 | 2.05 | 1.91 | 1.89 | 3.25 |
| Day 2 | | | | | |
| Number of Ratings | 27 | 27 | 28 | 26 | 22 |
| First Quartile | 1.45 | 1.33 | 1.35 | 1.34 | 1.50 |
| Second Quartile | 1.90 | 1.67 | 1.70 | 1.68 | 2.00 |
| Third Quartile | 3.06 | 2.00 | 2.14 | 2.10 | 2.92 |
| Day 3 | | | | | |
| Number of Ratings | 27 | 28 | 29 | 26 | 24 |
| First Quartile | 1.56 | 1.30 | 1.35 | 1.33 | 1.50 |
| Second Quartile | 2.21 | 1.61 | 1.69 | 1.65 | 2.00 |
| Third Quartile | 3.31 | 1.91 | 2.13 | 1.98 | 3.33 |
| Day 4 | | | | | |
| Number of Ratings | 27 | 28 | 28 | 26 | 24 |
| First Quartile | 1.45 | 1.33 | 1.37 | 1.36 | 1.55 |
| Second Quartile | 1.90 | 1.67 | 1.74 | 1.72 | 2.25 |
| Third Quartile | 2.88 | 2.00 | 2.33 | 2.38 | 3.60 |
| Day 5 | | | | | |
| Number of Ratings | 27 | 28 | 29 | 26 | 23 |
| First Quartile | 1.52 | 1.41 | 1.38 | 1.36 | 1.48 |
| Second Quartile | 2.38 | 1.82 | 1.76 | 1.72 | 1.96 |
| Third Quartile | 3.31 | 2.80 | 2.69 | 2.38 | 3.56 |
| Day 6 | | | | | |
| Number of Ratings | 26 | 28 | 28 | 23 | 22 |
| First Quartile | 1.81 | 1.54 | 1.47 | 1.38 | 1.50 |
| Second Quartile | 2.71 | 2.14 | 1.93 | 1.77 | 2.00 |
| Third Quartile | 3.90 | 3.25 | 3.00 | 2.56 | 4.17 |
| Day 7 | | | | | |
| Number of Ratings | 24 | 27 | 28 | 22 | 19 |
| First Quartile | 2.25 | 1.61 | 1.39 | 1.46 | 1.53 |
| Second Quartile | 3.60 | 2.42 | 1.78 | 1.92 | 2.17 |
| Third Quartile | 4.50 | 3.41 | 3.00 | 3.20 | 3.75 |
| TOTAL DAYS | | | | | |
| Number of Ratings | 184 | 194 | 199 | 175 | 158 |
| First Quartile | 1.54 | 1.38 | 1.37 | 1.35 | 1.49 |
| Second Quartile | 2.19 | 1.77 | 1.73 | 1.71 | 1.99 |
| Third Quartile | 3.53 | 2.65 | 2.38 | 2.26 | 3.50 |

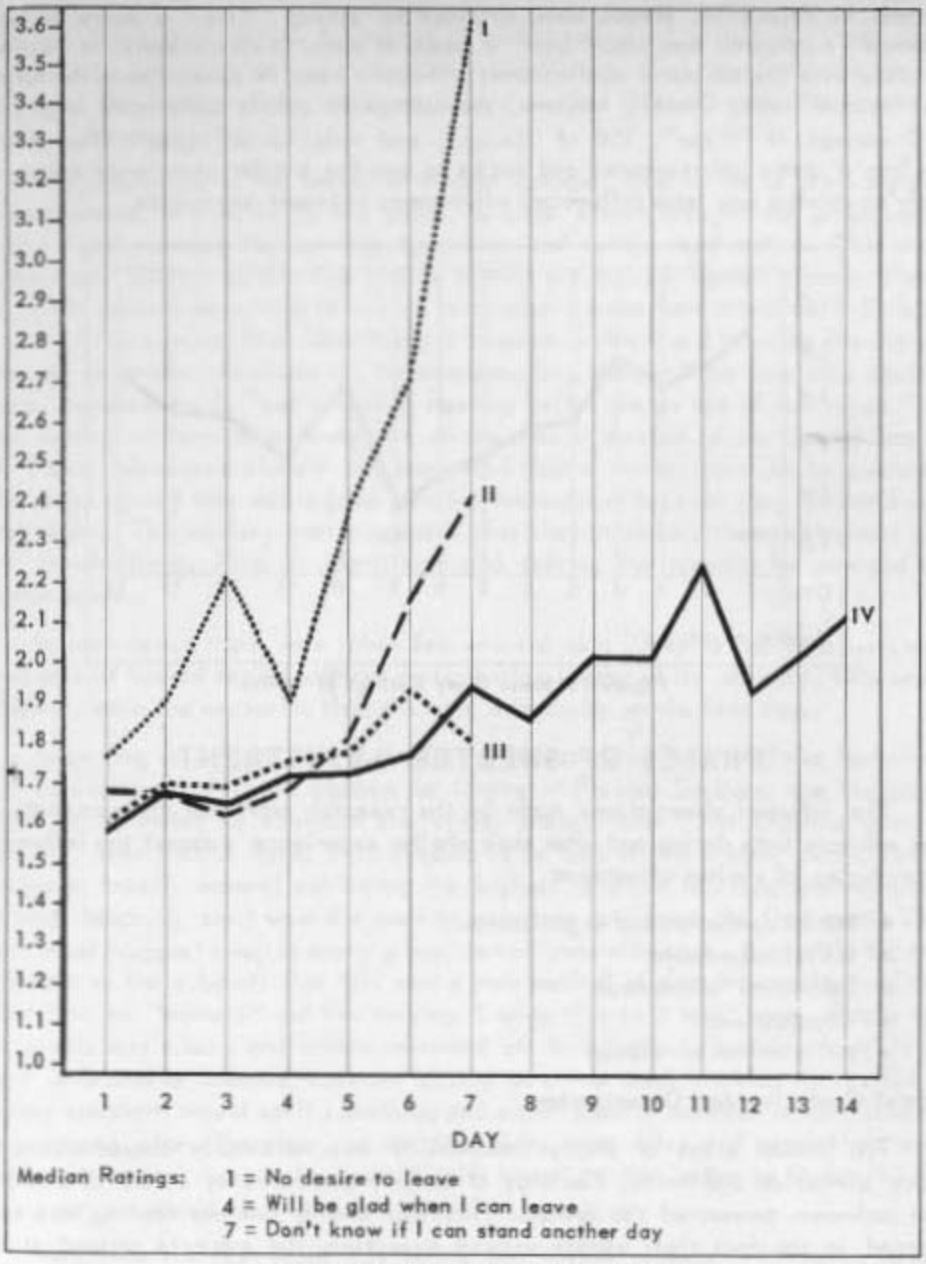


Figure 14. Diary Ratings -- Desire To Leave

**General Spirits**

An indication of the subjects' feelings in the shelter came from the individual diaries in answer to the question, "How were your general spirits today?" "Fine" "So-so" "Low". Mean daily ratings of general spirits for each day are

shown in Figure 15. Means were obtained by giving "Fine" a score of two, "So-so" a score of one, and "Low" a score of zero. Spirits seemed to decline slightly over the period of confinement, although Group IV seemed to rally during the second week. Overall, however, the ratings of spirits were quite high with 710 ratings of "Fine", 150 of "So-so", and only 12 of "Low". The strong feeling of group cohesiveness and desire to see the shelter experience successfully completed may have influenced willingness to report low spirits.

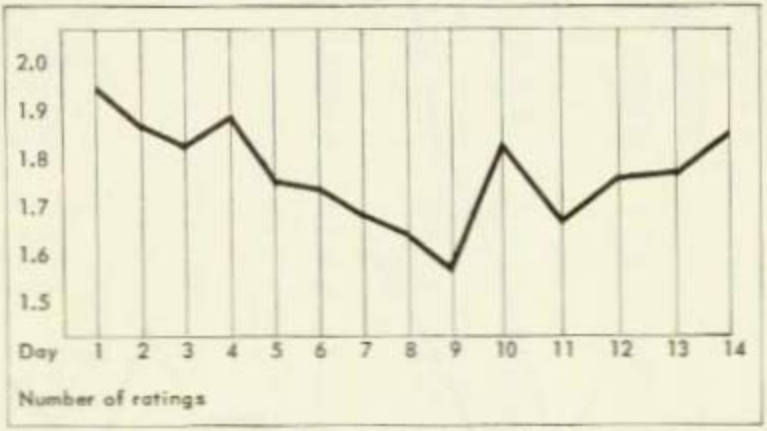


Figure 15. Mean Diary Ratings of Spirits

## PHASES OF SHELTER ADJUSTMENT

The informal observations made by the research staff and the comments of the subjects both during and after their shelter experience suggest the following five phases of shelter adjustment:

- Initial confusion and organization
- Initial adjustment
- Individual withdrawal
- Readjustment
- Anticipation of release

### Initial Confusion And Organization

The initial stage of shelter habitability was noticeably characterized by much confusion and noise. Feelings of anxiety generated by a fear of entering the unknown permeated the groups. This fear and/or anxious feeling was evidenced in the fact that, almost without exception, the subjects arrived at the American Institute for Research as much as one hour early.

The frequent giggling, boisterous laughter and use of loud voices observed during the first hours of shelter habitability further indicated tension and confusion. Everything from the mention of observation windows to the discovery of



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Chicken Chow Mein on the food shelves brought squeals of laughter. The conversation for the most part was about the shelter – the size, the facilities available and the needs of the subjects (i.e. a leader, a cook, someone to record Conelrad messages, etc.)

The emergence of the leader or shelter manager, whether he be preassigned, self-appointed or elected by the group, to some extent brought the group under control and reduced the nervous twittering and noisy vocalization. This was particularly evident in the two groups having pre-trained leaders (Group II and IV). Both leaders were able to ask for and receive immediate attention. In Groups I and III the subject first identifying a common problem and offering a solution emerged as leader. In Group III, for example, less than half an hour after shelter entry, someone said, "Let's have a meeting before we go out of our minds." A man having military experience and at the time a member of the United States Air Force introduced himself and suggested that a shelter manager be elected. The group agreed this was a good idea but impractical because they did not know each other. The military man suggested that they introduce themselves and led the introductions. Thus by identifying and solving the problem he emerged as as the leader.

In each group there were those few who sat in a corner or lay on a bunk and read or just looked around without participating in any of the activity. This was, however, more the exception than the rule, especially on the first day.

According to John H. Rohrer, *Studies of Human Adjustment to Polar Isolation and Implications of Those Studies for Living in Fallout Shelters,* one important factor that tended to alleviate the initial anxiety over "not knowing what to expect," was that of work. This seemed to be true in the shelter study. Those subjects (mostly women) exhibiting the highest level of fear and anxiety (loud talking, laughing, etc.) were the ones to volunteer to prepare the first meal. This first meal (supper) was, in every group, served cafeteria style. It quickly became apparent to the subjects that this was a poor method of distributing the food and from then on "waiters" did the serving. During this first meal some people sat on stools and chairs and others remained on their bunks. This was found to be very undesirable because someone sitting on a top bunk drinking hot coffee or eating spaghetti would spill something and either stain a mattress or burn himself or someone else. Therefore, on the first day, some rules and regulations were made and one of these rules, specifically stated by the leader in Group IV, was that everyone would sit on the lower level at meal time.

Bed time the first night was hectic and it took at least 30 minutes to one hour before all the bunks were assembled and everyone was ready to go to bed. The giggling and hushed conversations which continued long into the night indicate the difficulty most subjects had falling asleep and suggest further the nervous excitement prevalent during the initial period of shelter life.

**Initial Adjustment**

After the first day and night shelter living settled into a pattern and this pattern, with few exceptions, held true for the next four days. The atmosphere was much more relaxed. The group tended to divide into small recreational groups with friendships and cliques developing.

During these middle days of shelter living the need to do something became very important. The problem of keeping busy appeared to be critical. The performance of a task necessary to group survival and comfort gave the subjects a sense of responsibility and importance. Performance of a necessary task gave a feeling of strength and efficiency which, as discovered in the West German Civil Defense Agency Air Raid Shelter Manning Test (1959), played an important role in adjustment. This tendency to act for the group was seen in the fact that daily chores became a group responsibility. Where the adults, women in particular, took over the kitchen during the first day or two, by day three almost without exception the children and teenagers were eager to pitch in and help with such things as cooking, serving, and cleaning up at meal time. One evening during the second one week study a seventeen year old boy prepared a spaghetti supper. He was very proud of himself. Upon leaving the shelter he said to one of the observers, "I hope you got a picture of me cooking supper because my mother will never believe I did it!"

**Individual Withdrawal**

At a point slightly past the middle day a period of quiet rest appeared. The subjects seem to attempt to get away from the shelter and the monotonous routine of shelter life. The length of time it took for this tendency to withdraw to appear varied among individuals. When, however, the acknowledged leaders experienced the need to get away the group as a whole tended to follow. In all four groups, at approximately the same time (just after the middle of the study) a period of quiet resting was observed.

During this quiet time, which lasted approximately from after supper through supper of the next day, the shelter was marked by much resting, sleeping, and an extremely quiet atmosphere. Even the meals were small and some had no desire to eat at all, remaining in their bunks and sleeping through the meals. It seemed to take longer to do everything and no one had much energy especially when it came to preparing, serving, and cleaning up after meals.

The report by the West German Federal Civil Defense Agency (*Report on the Preparations for and Execution of an Air Raid Shelter Manning Test in Shelter "A" of the Waldbroel Federal Air Raid Protection School, 1959, p. 50)* expressed the observance of a quiet period:

> *During the first 3 days, about three-fourths of the testees stated that they felt well-balanced or cheerful; during the remaining 2 days, only half of them made that statement. The remaining testees stated that they were quite depressed or restless, cross or*

*edgy. Two of them complained of agoraphobia and felt that the constant coexistence amid the group was unbearable.*

After supper the activity level was a little higher than during the day but the general atmosphere was still one of quiet relaxation.

**Re-adjustment**

Following a day of quiet resting the subjects resumed their normal activities. Group games and conversations emerged. Again there was a busy relaxed atmosphere in the shelter.

**Anticipation of Release**

The last 24-36 hours of shelter habitability were marked by tension and some temper outbursts. There was much gossip among small groups, (mostly women). Near the end of Study IV, for example, three women went into the lavatory and whispered about a missing pack of cigarettes, accusing one of the young men of being the thief.

The behavior of the subjects during the last day and a half was much more individual than during the rest of the week. The concentrated effort to be thoughtful and considerate of each other was not so concentrated. For example, on the last day of Study III there was some discussion as to whether or not they should make lunch. No one was particularly hungry but it was close to the appointed lunch time. The problem was that no one would volunteer to clean up after the meal. Where during the early part of the week there were always people anxious to do whatever needed to be done during the last day every task that had previously been done willingly by someone became a chore for which no one wanted to volunteer. One of the women was heard to remark, "I will not wash another dish in this shelter!"

The activity level during the final hours of shelter habitability was high but interest span was short. Tempers flared quickly and desire to leave increased slightly. Some pent up aggressive responses came to the surface bringing about some unpleasant remarks and acts. For example, during the last day of Study IV two of the young men stole the diary of one of the women and proceeded to read it against her wishes. This was an example of the aggressive "I don't care anymore" feeling that emerged at the end. A concerted attempt on the part of Group II leaders to prevent the occurence of this pre-emergence tension through active participation of the group in organized activities seemed to be successful in keeping the level of observable tension in this group to a minimum.

It is interesting to note that almost immediately upon leaving the shelter hostile feelings existing between some subjects disappeared almost completely. The feeling seemed to be ". . . it's over . . . it wasn't too bad . . . we really had a good group . . . everyone was OK . . ."

## SIMULATION FACTORS

In a discussion of behavior as a function of time in the experimental shelter two important factors resulting from this being a simulated rather than actual situation must be considered. First, the subjects had been told, before entering the shelter, that the experiment would last at least three days but no more than one or two weeks as the case may be. The subjects, therefore, knew to the day when they could leave. This knowledge made it possible for them to ration supplies easily and it also gave them a goal toward which to aim. Remarks such as, ". . . only four more days . . . it's half over . . . I wonder if my mother will be here to pick me up on Sunday . . ." were not uncommon in the shelter. According to Jeannette F. Rayner, (*An Analysis of Several Surveys Relative to Problems of Shelter Habitability, January 1960, p. 32*):

> *When duration of confinement is expected to be short, or the terminal date is definite, people are oriented to the time of release rather than to the interim period of time.*

The pre-determined time of shelter exit could account in some measure for the overall ease of adjustment experienced by the subjects. Secondly, each subject was offered an honorarium of $50.00 per week. Concern over the loss of this honorarium if they left or had to be removed may have induced some shelterees to suppress maladjustive behavior that might otherwise be caused by a period of shelter confinement. However, it seems doubtful that this motivation would have been sufficiently strong to have affected any serious maladjustive problems.

# CHAPTER 9. INDIVIDUAL DIFFERENCES AS THEY RELATE TO SHELTER ADJUSTMENT

This chapter contains the following major types of information:

1. A description of the manner in which exceptionally well and poorly adjusted shelterees were identified.
2. A comparison of observer and fellow shelterees' evaluation
3. A review of some of the shelter behaviors that make for "good adjustment", including a series of brief sketches concerning unique individual adjustment patterns.
4. A study of pre-shelter personal characteristics as they relate to in-shelter adjustment.
5. A discussion of the implications of individual differences for civil defense planning.

## IDENTIFICATION OF EXCEPTIONALLY WELL AND POORLY ADJUSTED SHELTEREES

For the purpose of this analysis good shelter adjustment was defined as the expression of a minimum number and severity of personal problems and a maximum number of social responses conducive to group survival. Using these criteria, the 12-14 staff observers for each study nominated two to five subjects who adjusted exceptionally well and two to five who adjusted exceptionally poorly within their shelter group. Each observer ranked his nominees according to the extent of their adjustment within their own group. Rankings were then assigned scores as follows:

| Rank | Score |
|---|---|
| 1 | 5 |
| 2 | 4 |
| 3 | 3 |
| 4 | 2 |
| 5 | 1 |
| Not Nominated | 0 |

Total scores were then obtained for each nominee by summing scores for all observers.

Points of major discontinuity in the range of good and poor adjustment scores were used as cut-off points to select a small number of exceptionally well and exceptionally poorly adjusted subjects from each shelter group.

As a result of the analysis described above a total of nine good and eight poor adjusters was identified from all groups. All of these shelterees had outstandingly good or poor adjustment scores in relation to the other members of their group.

## COMPARISON OF OBSERVER AND FELLOW SHELTEREES' EVALUATIONS

It was felt that the observer rankings of shelter adjustment should be related to the shelterees' nominations of one another concerning their desirability as "shelter mates." At the end of their shelter stay each subject identified three members of his group whom they would prefer to have with them in a shelter during an actual attack. They also selected two people whom they would want to serve as shelter leader. The total number of mentions of an individual within either of these categories served as a positive score of social desirability. Both categories were used since the nominations were mutually exclusive and it was assumed that those named as leader would also be named as desirable shelter companions. A negative score of social desirability was obtained by counting the frequency with which an individual was nominated when his shelter peers were asked to name undesirable shelter mates. The algebraic sum of these two scores for each subject was used as his total social desirability score. The median social desirability score was computed for each shelter group. The 17 good and poor adjusters identified by the observers then were classified as having high or low social desirability according to whether their scores fell above or below their group median. A phi coefficient* was used to correlate the dichotomous variables of good vs. poor adjustment with high vs. low social desirability. The analysis is summarized in Table XIX.

**Table XIX. Correlation of Observer Judgment with Peer Judgment**

| | | Social Desirability | | |
|---|---|---|---|---|
| | | Low | High | Total |
| Observer Judgments | good | 0 | 9 | 9 |
| | poor | 6 | 2 | 8 |
| Total | | 6 | 11 | 17 |

$\phi = .75$

The correlation of .75 indicates that the staff observers and the shelterees themselves used similar criteria in making judgments concerning the adjustment and social desirability of the subjects. This fact is emphasized when the social desirability of the exceptionally good and poor adjusters is reported in terms of centile ranks. The median centile rank for social desirability of the exceptionally good adjusters was 96.0. The median social desirability centile rank for those exhibiting exceptionally poor adjustment was only 4.5. In summary, there was considerable agreement between observers' evaluations of adjustment to the shelter situation and fellow shelterees' selection as desirable shelter companions.

*Phi is a measure of relationship between two dichotomies having a possible range from -1.00 to +1.00. It may be interpreted in the same manner as the Pearson product moment correlation coefficient (r), except that phi yields a low estimate of relationship when the variables are not truly dichotomous.*

## COMPONENTS OF SHELTER ADJUSTMENT

Aspects of behavior which might reasonably be components of shelter adjustment were investigated. Although the factors considered here include only a portion of the responses related to shelter adjustment, it is felt that the examination of these behaviors in relation to overall adjustment of the individual provides some insight into the problem of shelter living.

***Constructive Behaviors.*** It was felt that a positive relationship should exist between observer judgments of adjustment and the amount of constructive shelter behavior exhibited by the subject. Constructive shelter behavior was defined in terms of the number of times an individual was observed participating in food preparation or serving, bunk rearrangement, or shelter maintenance. Other behaviors, such as consoling a disturbed companion, also might be classified as constructive behavior and should be related to adjustment. However, they were not readily amenable to objective measurement.

The mean number of constructive behaviors exhibited during the shelter stay was calculated for each experimental group. Good and poor adjusters who emitted more constructive behaviors than the mean of their group were classified in the category of high constructive behavior. Those falling below the mean were regarded as low in constructive behavior. Computation of a phi coefficient revealed a correlation of .65 between shelter adjustment and the frequency of constructive behavior by the shelteree. The data are summarized in Table XX.

**Table XX. Correlation of Observed Adjustment with Frequency of Constructive Shelter Behavior**

| | Constructive Behavior | | |
|---|---|---|---|
| | Low | High | Total |
| good | 2 | 7 | 9 |
| poor | 7 | 1 | 8 |
| Total | 9 | 8 | 17 |

$\phi = .65$

Apparently, helpful or constructive behavior within the shelter is one component of good shelter adjustment.

***Gregariousness.***

It was felt that in the close quarters of the shelters, where social withdrawal was very difficult, the acceptance of a gregarious role might be a mark of good shelter adjustment. The indices of gregarious behavior utilized for this analysis were:

- movement about the shelter
- playing games
- kibitzing
- singing
- talking

The median frequency of all of the above types of behavior was calculated for each experimental group. The behavior of the exceptionally good or poor adjusters was dichotomized according to whether their score fell above or below this median, and a phi coefficient of correlation was used to determine the relationship of gregarious behavior to shelter adjustment. The results of this analysis are summarized in Table XXI.

**Table XXI. Correlation of Gregarious Behavior with Shelter Adjustment**

| | | Gregarious Behavior | | |
|---|---|---|---|---|
| | | Low | High | Total |
| Adjustment | good | 3 | 6 | 9 |
| | poor | 3 | 5 | 8 |
| | Total | 6 | 11 | 17 |

$\phi = .04$

The phi coefficient of .04 indicates that there was substantially no relationship between shelter adjustment and gregarious behavior. Informal observation suggests that exceptionally poorly adjusted individuals moved within a smaller social circle in the shelter than exceptionally well adjusted participants. The quantitative data, however, are not readily amenable to an evaluation of this hypothesis.

### *Aggressive or Hostile Behavior*

The necessity for continuous social interaction and the difficulty in withdrawing from unpleasant situations usually made the direct expression of aggressive or hostile behavior undesirable. However, as is often the case in other societies, an individual occasionally had to be aggressive in order to meet his social, or even physical needs while in the shelter. Nevertheless, excessively aggressive or hostile behavior usually was not conducive to good shelter adjustment. That this is the case is evidenced in the frequency of aggressive or hostile behavior exhibited by various groups within the shelter population. Aggressive behavior was generally in the form of a verbal exchange. Direct physical violence did not occur in any group. The median number of such responses exhibited by all of the subjects with the exception of the outstandingly good and poor adjusters was 1.19. "Average" shelterees, then, exhibited very little aggressive or hostile behavior during their shelter stay. Those who adjusted exceptionally well, however, exhibited somewhat more aggression. This is probably because, without exception, the good adjusters also played an important leadership role. Consequently, they had a special responsibility for dealing with the aggressive behavior of poor adjusters and for imposing group standards on others. The median frequency score for this group was 3.75. Exceptionally poor adjusters, on the other hand, had a relatively high frequency of aggressive behavior, the median for this group being 6.5.

*Sleep*

Good and poor adjusters rated sleep in their daily diaries substantially the same, with good adjusters rating the adequacy slightly lower.

Of the nine persons selected as being exceptionally well adjusted, only Mrs. Jones from Study I was directly involved in a serious problem with sleep. Although Mrs. Jones seemed able to get along with very little sleep, some of her noisy nighttime activity was apparently a major irritant to some of her fellow shelterees. This was the cause of at least one major argument in the shelter and was caustically commented on by several fellow shelterees in post-shelter interviews.

Most of the other exceptionally good adjusters reported some difficulty in obtaining sufficient sleep, but experienced no serious problems. Trained and designated managers Craig and March had some problems in getting shelterees to abide by nighttime rules, but generally obtained fairly good cooperation. Emergent leader Boyd had major problems in getting such cooperation from some shelterees and reported almost resorting to physical violence on a couple of occasions. Mr. Knight, who emerged as principal leader of Study I, never did come to grips with the noise and sleep problem for the entire group, although he did manage to sleep relatively well himself.

Four of the eight persons selected as being poorly adjusted, all of those selected from "unled" groups, had serious problems involving sleep. Mr. Black from Study I got almost no sleep during his first three days in the shelter. This was probably a major factor in his confusion and subsequent removal from the shelter. Mrs. Grey, also from Study I, was regularly reported by nighttime observers to have great difficulty in sleeping. This is likely to have been a factor in her depression and near-request to be removed from the shelter.

Miss Brown and Mr. Steele from Study III were both widely criticized for their excessive noise and activity at night. This was a major factor both in their selection by observers as poor adjusters and nomination by fellow shelterees as least wanted for shelter companions.

In summary, there are some relationships between shelter adjustment and sleep problems that have not yet been fully defined or quantified.

## PERSONAL SKETCHES

The data presented above emphasize some common behaviors related to shelter adjustment. Each of the 17 individuals identified as exhibiting exceptionally good or poor adjustment also possessed certain characteristics unique to their manner of adjustment or lack of adjustment. Unique aspects of the shelter behavior of each of these individuals are discussed below.

**Individuals Exhibiting Exceptionally Good Shelter Adjustment.**

*Mr. Knight* emerged as the shelter leader in Group I during the collapse of

Mr. Black who was subsequently removed from the shelter. Mr. Knight's adjustment was one of the highest recorded during all of the experiments. He was not an aggressive individual, but served as a non-directive, participant leader. Although he made many decisions concerning various problems of shelter living, these decisions usually were passed along to the group by other more verbally aggressive shelterees. Mr. Knight had his wife and three children in the shelter with him, and provided the steady, "family man" influence for the group. His lack of aggression, however, resulted in some ambiguity in his leader role as perceived by the other members of the group. This resulted in the less effective solution of some shelter problems than might otherwise have been the case.

*Mrs. Jones* was a loud, good natured, but somewhat coarse member of Group I. She had something to say about almost every situation which arose within the shelter, and often acted as the spokeswoman for Mr. Knight. Her good rating by both observers and peers may be attributed largely to her active participation in every phase of shelter living and her generally optimistic and friendly attitude. However, the fact that her language and conversation were considerably more coarse than that established in most upper socio-economic groups somewhat reduced her peer rating of social desirability. Her boisterous behavior late at night in a group in which sleep deprivation developed as a major problem occasionally led to the expression of open hostility within the group. This, and also the fact that she often talked without first thinking about shelter problems, resulted in a slightly lowered observer judgment of good adjustment.

*Mr. Craig* was the appointed leader in Group II. He was a professional civil defense instructor and did an excellent job of shelter management. His high rating by both observers and peers may be attributed largely to his leadership function, which he handled with a minimum of personal stress.

*Miss Curry* was a disaster research worker assigned as deputy manager in Group II. She performed her managerial duties quite successfully, and seemed to be subjected to even fewer personal tensions than Mr. Craig. A major role played by Miss Curry, a mature and outgoing 41 year old woman, was that of "big sister" to some of the other shelter inhabitants. Her adjustment score was just slightly higher than that of the head manager, possibly because of a minimum of observable personal tension. This might be attributed to the fact that Miss Curry had to cope directly with fewer shelter problems than did the head manager, Mr. Craig.

*Mr. Boyd* assumed command of Group III within minutes of shelter entry. An airman on leave, he quickly emerged as the leader of this "unmanaged" shelter group. His management technique was very strict and somewhat militaristic. Because of this approach, and also possibly due to the presence in the shelter of a low socio-economic sub-group, he was subjected to considerable stress in the form of challenge to his leadership. Mr. Boyd occasionally met this challenge by fabricating stories concerning the adventures of his military career. He also concealed his relatively young age (22) from the group for the entire duration of their shelter stay. Although Mr. Boyd later explained to the project staff that

this behavior was a deliberate attempt to retain his status, it should be pointed out that he related similarly exaggerated stories to the project staff during his pre-shelter interviews. Although Mr. Boyd retained his hold on the group, his status was reduced by the end of the shelter stay and his personal adjustment was seriously threatened on several occasions. Several quiet conversations were overheard in the shelter that were critical of the authoritarian leadership.

***Mrs. Hatfield*** was elected by Group II to serve as deputy leader to Mr. Boyd at his suggestion. Her election was based on the fact that she was a member of the American Legion Auxilliary. Although greatly overshadowed in authority by Mr. Boyd, Mrs. Hatfield was able to cope with the responsibility assigned to her, and her relatively easy-going attitude served as compensation for the rigid leadership imposed by Mr. Boyd.

***Mr. March*** was the professional civil defense instructor appointed as head manager of Group IV. An expert in small group processes, he did an exceptional job in coping with the problems of shelter living. He established a fairly democratic structure for shelter management, thus avoiding many of the tensions associated with autocratic leadership. He felt under personal stress only once during the two-week shelter stay, and received the highest score among all subjects of observer judgment of good shelter adjustment.

***Mr. Braun,*** also in Group IV, was a plant security guard with many years experience as a civil defense volunteer. He had received training as a radiological monitor. His wife and three children were in the shelter with him. Mr. Braun was a big man with an air of authority. He was often approached for the solution of problems, such as bunk arrangement, which had little to do with his civil defense experience. Although he handled all of his responsibilities well, Mr. Braun occasionally was disturbed by lack of sleep, and it was felt that if he had been saddled by total shelter leadership his personal adjustment would have been somewhat reduced.

**Individuals Exhibiting Exceptionally Poor Shelter Adjustment.**

***Mr. Black*** was the only subject who had to be removed from the shelter during the course of the experiments. The project shelter staff requested that he leave the shelter on the morning of the sixth day of Study I because of his short-term adjustment difficulty. Although the maladjustment symptoms disappeared shortly after his exit from the shelter it was felt that he would have been incapable of functioning properly had he remained in the experimental situation. Mr. Black attempted to assume leadership of the group immediately upon entering the shelter, and at first met with some success. His level of general ability was quite low, however, and it soon became evident to other members of the group that his decisions concerning certain problems of shelter living were inappropriate. His leadership was challenged, and Mr. Black attempted to remain awake at night in order to "stay on top" of the situation. Bizarre behaviors on his part were observed as early as the first night in the shelter, and

he had lost all semblance of leadership by the time he was removed from the shelter.

***Mrs. Grey,*** also in Group I, remained somewhat withdrawn during her entire shelter stay and lapsed into a state of mild depression on the last evening of the experiment. She voiced considerable displeasure, both while in the shelter and later to the research staff, concerning the noise in the shelter during the night and the romantic behavior of some of the teen-age shelterees. When she became depressed she asked to leave the shelter but was talked out of this by the other members of her group. She had recovered from this depression by the following morning. Although mild withdrawal did not always result in poor shelter adjustment, Mrs. Grey's few social responses were nearly always negative. In addition, her request to leave the shelter certainly may be considered indicative of poor shelter adjustment.

***Miss Rush*** (Group II), contrary to the maladjustive patterns exhibited by the two subjects in Group I, adjusted poorly to the shelter situation in terms of her direct interaction with others. Although relatively happy in the shelter situation, Miss Rush, a woman in her early fifties, had a tendency to "nag" at the younger members of her group, and to resist suggestions given by her fellow shelterees. This latter characteristic was particularly unfortunate, since Miss Rush was the chief cook for her group, a function which was subject to many suggestions from practically every shelteree. Although her form of maladjustment was not as severely judged by the observers as the cases in Group I, Miss Rush's attitude created some tension in the shelter and sharply reduced her social desirability, particularly among the younger members of the group.

***Billy Myers,*** age ten, was selected as poorly adjusted and was the only child who was selected as either exceptionally well or poorly adjusted. He had personality problems prior to entering the shelter. Two brief interviews with the boy and his parents suggested that many of the social responses attempted by the boy were rigidly suppressed by his mother. (During his initial interview the boy was struck twice by his mother for attempting to ask questions of the inviewer.) The shelter environment, in which neither parent was present, provided a comparatively permissive situation for the boy. The entire situation was aggravated by the fact that the boy was a compulsive eater. Although his interactions with the cook, Miss Rush, were surprisingly restrained under the circumstances, the boy was a mild discipline problem in the shelter and often was unhappy with the limited amount of food available to him.

***Mr. Steele*** was a young man of above average intelligence who had quit school in the eleventh grade and was an unemployed machinist. He had both the ability and the inclination to provide the major challenge to Mr. Boyd, the emergent leader in Group III. Mr. Steele had received some reserve Air Force training and occasionally corrected, with apparent relish, some of the leader's "war stories." In addition to the expression of open hostility toward the shelter leader, this individual stayed awake following the agreed time for retiring and

talked loudly with Miss Brown, a young woman in the shelter. Creating disturbances during sleeping hours always met with disfavor from the other shelterees, and Mr. Steele's status was reduced even more by his romantic behavior with Miss Brown which often included playful but violent wrestling, apparently by mutual consent, on the bunks. Although he apparently felt under very little tension during his shelter stay, Mr. Steele's social behavior resulted in a judgment of extremely poor shelter adjustment.

***Miss Brown,*** the companion of Mr. Steele during most of Study III, was the other exceptionally poorly adjusted member of that group. Her behavior was similar to that of Mr. Steele, except that her hostility toward the shelter leader was somewhat more restrained. With the exception of her interaction with Mr. Steele, Miss Brown remained relatively withdrawn from any social interaction with her fellow shelterees. Her lack of contribution to the social structure of the group along with her activity and noisiness at night and her socially disapproved relationship with Mr. Steele resulted in a judgment of exceptionally poor adjustment.

***Mr. Stark,*** a 22 year old unemployed veteran, was judged the most poorly adjusted member of Group IV. His major difficulty appeared to be his inability to adjust to the social distance which existed between him and most of the other shelter inhabitants. His initial substandard behavior was exhibited in the form of relatively free use of profanity, somewhat unrestrained behavior toward young women, and an inability to accept adult responsibility during the course of shelter living. His reaction to the group's rejection of his standards was withdrawal from general group processes and verbally aggressive behavior toward a married female shelteree who had subjected him to rather severe verbal teasing early in the shelter stay. Both of these behaviors served to further ostracize him from the group. Although through his withdrawal Mr. Stark retained fairly adequate personal adjustment during the two week test, his defensive behavior created some tension in the group. During the first week of his stay he reported to the manager that he was extremely bored. By the second week he was somewhat more accepted by the group and completed his shelter stay without serious incident.

**A Special Case: Mr. Mann**

***Mr. Mann*** was the individual who participated in both Study I and Study IV. He was judged as exceptionally well adjusted in Group I and an exceptionally poorly adjusted member of Group IV. His good adjustment in Group I is attributed to his gradual assumption of responsibility with his increasing perception of his status within the group. His physical prowess was advantageous to him in achieving status among young males in the group and also because of the temporary physical threat to the group by the breakdown of Mr. Black. He was quite popular with children and spent considerable time keeping them entertained. In Study IV, however, Mr. Mann was thrust into the responsibility of deputy manager. He was not able to fulfill his responsibilities as deputy shelter manager and, in an effort to maintain status, assumed the role of a "planted agitator," although

this was clearly contrary to the wishes of his shelter manager and prior orientation by the project staff. This, along with the fabrication of a personal history (for the same purpose, but with less skill than that displayed by Mr. Boyd, Group III leader) resulted in his exceptionally poor adjustment in Group IV.

It is significant to note that individuals who were assigned or attempted to assume some leadership role within their shelter group often achieved recognition as either exceptionally well or exceptionally poorly adjusted shelterees. The direction of their adjustment usually was related to their success or failure as leaders.

## PERSONAL CHARACTERISTICS RELATED TO ADJUSTMENT

Prior to the conduct of the actual experiments a great deal of individual information was obtained concerning each of the prospective shelterees. This included biographical information such as age, occupation, etc., as well as test scores of such traits as intelligence, neuroticism and others. Additional information concerning each individual was obtained during the two interviews conducted prior to the study. The personal history and test data are presented in summary form for each of the experimental groups in Table III in Chapter I.

The individual characteristics of all of the participants in the studies were compared with an observer rating of their adjustment and leadership ability. This adjustment score used for all subjects was a composite rating of the following characteristics:

- Follower-Nonfollower
- Participant-Nonparticipant
- Helpful-Troublemaker
- Busy-Lethargic
- Calm-Tense
- Accepted-Rejected
- Friendly-Unfriendly
- Aggressive-Passive

Each subject was rated on a seven-point scale for each of these characteristics. The highest rating was given for the end of the continuum mentioned first in the above list. An exception to this was Aggressive-Passive, in which the highest value was given to a rating midway between the two extremes. The individual adjustment score was the total of the ratings for each component characteristic. Leadership was evaluated on a similar seven-point rating scale. This variable had no component characteristics. The correlation of adjustment and leadership scores with certain individual characteristics is presented in Table XXII. The difference in N for these various analyses is a result of the unavailability of some scores for certain individuals.

**Table XXII. Correlation of Individual Differences with General Shelter Adjustment**

| Variable | Type Correlation | N | Correlation with Adjustment | Correlation with Leadership |
|---|---|---|---|---|
| Sex | rp-bis* | 120 | −.09 | .02 |
| Age | r** | 120 | −.34 | .15 |
| Occupation | rp-bis | 120 | .01 | .14 |
| Education | rp-bis | 120 | .01 | .10 |
| Intelligence | r | 85 | .01 | .41 |
| Neuroticism | r | 95 | −.01 | −.05 |
| Extroversion | r | 95 | .01 | −.01 |
| CD Experience | rp-bis | 120 | .01 | .22 |
| CD Information | rp-bis | 91 | .09 | .20 |

*rp-bis is the point biserial or product moment biserial correlation coefficient which is a measure of relationship between a true dichotomy and a continuous variable, having a range from −1.00 to +1.00.

**r is the Pearson product moment correlation coefficient.

Only age had any appreciable relationship to the adjustment rating, with a tendency for younger persons to be rated as better adjusted than older persons. Intelligence was the only variable appreciably related to leadership.

# CHAPTER 10. INTERPERSONAL BEHAVIOR DURING SHELTER OCCUPANCY

## FORMATION OF INTERPERSONAL RELATIONSHIPS

The shelter situation was characterized by a complete lack of social contact with friends and loved ones in the outside world. The deprivation of this social need led to the development of some unique interpersonal relations within the shelter group. There was a rapid development of very close friendships within the group. Relationships between some individuals developed to a point of emotional intimacy usually never achieved in as short a period as the shelter stay. Informal contact with some of the subjects as long as one month following their shelter experience indicated that these relationships were retained after the end of the experiment.

Another characteristic of shelter living was the rapid formation of sub-groups within the general shelter population. Sub-grouping occurred within minutes of shelter entry and remained relatively stable for the duration of the confinement period. This sub-grouping usually occurred on the basis of common acquaintance, background, and interest among the subjects. The allocation of some shelter functions according to groups rather than individuals increased the stability of this social structure. Similarly sex and age were strong factors in determing sub-groupings. In general, they appeared to be as strong or stronger than family affiliation in determining time spent together.

## GROUP COHESION

In addition to the development of close friendships and the occurrence of sub-grouping the cohesiveness exhibited by entire shelter groups was exceptional. Life inside the shelter quickly became sharply distinct from activities external to the group. Observers on the project staff, who were physically very close to the situation, were separated from the shelter society by use of the pronoun "them" while those in the shelter were "us" or "we." It was particularly interesting to note how shelter leaders, who had during their orientation to the study established a fairly close relationship with the project staff, quickly lost this primary association and identified with their shelter group. A similar experience was reported by the project director who spent the last 20 hours of Study IV in the shelter. During the post-shelter interviews almost every subject from every study commented that they couldn't have been confined in a shelter with a better group.

High esprit de corps of social sciences experimental groups has been widely reported and may be a factor here. Just the knowledge that the subjects were participating in a research study may have enhanced group cohesion and morale.

The group cohesion and morale was most directly reflected in a determination to remain intact as a group and prove that it could come through the test

with flying colors. A number of subjects confided after the test that they planned to leave after a couple of days if the going got rough. After once getting integrated into the group they no longer even considered this possibility. The subjects with elevated temperatures who refused to report them and the woman who elected to remain with her group after being informed that a close relative was critically ill exemplify this determination.

## HOSTILITY

The closeness of interpersonal relations within the shelter and the cohesiveness of the experimental groups resulted in a general suppression of hostility within each group. As indicated in Chapter 9, there was very little aggressive or hostile behavior expressed within any of the shelter groups. This was contrary to the expectations of most of the shelterees, as expressed in their pre-shelter interviews. When asked what difficulties they expected to arise from shelter living a typical response was "I suppose people may get on each other's nerves." Although this probably alerted shelterees to avoid hostility-including situations, such responses also may have been suppressed in order to preserve the valuable close relationships which existed in the shelter. The few hostile responses which did occur were frequently expressed through confidential conversation within a sub-group, rather than through direct attacks upon the offending individual. For example, the woman in Group IV who was the subject of Mr. Stark's aggression, often told her troubles to a small circle of sympathizers rather than talking back to her tormentor. Hostility, then, was suppressed, or else expressed indirectly within the safe confines of the individual's sub-group. Subjects also frequently told their complaints about fellow shelterees to a designated or informal leader privately and sometimes with the expectation of action and more often merely to "get things off my chest before I explode."

## STANDARDS OF CONDUCT

Perhaps related to the suppression of hostility was the general trusting attitude which prevailed in the shelter. Although the supply of food, cigarettes, and other items was limited, strict rationing rarely was introduced into the shelter organization, and no formal watch was kept over the provisions. While this certainly was in part a function of the relatively small size of the groups as well as the exposed location of the supplies, there was some feeling that the incorporation of formal protective measures would jeopardize the cohesiveness of the group. This was reflected in comments by shelter leaders to the effect that they did not like to think that such measures were necessary.

Such trusting attitudes were threatened, however, by an apparent tendency of the general shelter population to accept standards of behavior somewhat lower than the expected average for such a group.

Such tendency possibly was due to the fact that those shelterees possessing higher standards also tended to have higher socio-economic status and be better educated. Such individuals were more willing to adjust to changed stand-

ards in order to preserve pleasant interpersonal relations within their group. Effective shelter management served to reduce the lowering of standards. Group cohesiveness usually was preserved in these instances with acceptance of hostility on an individual basis by the shelter leader.

## SCAPEGOATS

Some breach of shelter etiquette did occur. This included the occasional disappearance of cigarettes and other items, in addition to incidents such as the sabotage of bunks and other foolish practical jokes. In these cases where the person responsible for the act could not readily be identified, blame was often directed toward a scapegoat. Individuals selected as scapegoats often had committed other offensive acts earlier in their shelter stay and thus been alienated from the group. It is interesting to note, however, that social isolation in itself occasionally caused a shelteree to become a scapegoat. This may be because isolates posed a threat to group cohesiveness, and thus became an object of group hostility. In general, however, the primary shelter group was surprisingly tolerant of behavior that deviated from their norm.

# CHAPTER 11. MEDICAL ASPECTS OF SHELTER TESTS

## MEDICAL EXAMINATION

Before any applicant was finally selected to participate in the shelter habitability study he was given a thorough physical examination. The primary reason for giving three medical examinations was for the protection of the subjects. It was not within the scope of this experiment to study detailed aspects of medical problems in a fallout shelter. The first examination, conducted approximately one week before the start of each test, included a chest X-ray, urinalysis, blood test and general physical check up as well as a complete medical history. At the time of the initial medical examination only one girl and one boy out of approximately 200 people examined were disqualified. The girl was rejected on the basis of a heart murmur which could have been associated with active, but subclinical, rheumatic fever and the boy for psychological reasons on the advice of his psychiatrist.

Immediately prior to entering the shelter each participant was given a second examination by a registered nurse. This examination consisted of weight and temperature reading and a general check for sore throats, coughs and colds. At this examination, before the final study, one young girl was disqualified because of a head cold.

A third and final physical examination was given by a nurse to every subject immediately following the shelter exit. Weight and temperature were checked and a throat examination was made. Each subject was asked if he had any physical complaints. If, in the judgment of the nurse, the complaint might be serious; the subject was examined by a physician.

## WEIGHT LOSS

A summary of weight loss for different groups is given in Table XXIII.

It is interesting to note that the mean weight loss was greater for men than for women or children. Men are accustomed to eating larger portions than women or children and probably reduced the amount of food consumed much more than others, even though they were eating the same or slightly more than their companions in the shelter. A major cause of weight loss in children was probably lack of food selection. Children were less likely to eat something they did not like, although several children were very proud of themselves when they tasted and found they liked a food they had never before eaten.

It seems that weight loss tended to stabilize over a period of two weeks. It was not possible to weigh subjects in the two week group until the end of the two weeks. Assuming that weight loss for Group IV was approximately the same

after one week as Groups I, II and III, it appears that rate of weight loss decreased during the second week. The "hot" temperature for Groups I and IV appeared to have no appreciable effect on weight loss.

**Table XXIII. Mean Weight Loss of Subjects**

| | Group I | | Group II | | Group III | | Group IV | | All Groups | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N* | M** | N | M | N | M | N | M | N | M |
| Adult males 16 and over | 8 | 3.5 | 11 | 5.0 | 6 | 3.4 | 10 | 8.4 | 35 | 5.4 |
| Adult females 16 and over | 15 | 3.0 | 13 | 1.3 | 18 | 3.3 | 10 | 3.3 | 56 | 2.8 |
| Children 15 and below | 6 | 1.6 | 6 | 5.0 | 6 | 3.6 | 10 | 4.3 | 28 | 3.7 |
| All Subjects | 29 | 2.8 | 30 | 3.4 | 30 | 3.4 | 30 | 5.4 | 119 | 3.8 |

*N is the number of subjects
**M is the mean (average) weight loss

The food supply in the shelter provided enough for each subject to consume 2000 calories per day. This should have been sufficient to enable the subjects to maintain their usual weight. However, each group had food left at the end of the study. Weight loss can probably be attributed to several factors; (1) lack of exercise lessens appetite, (2) high temperature and humidity lessens appetite, (3) limited variety of food causes people to eat less on a day when a food they dislike is served, and (4) groups tried to have some food left at the end of their stay to simulate what they would do in a real attack.

## INDIVIDUAL MEDICAL PROBLEMS

Although any person found to have a contagious disease (e.g. tuberculosis) would have been disqualified, those persons with a physical handicap were not only accepted but encouraged to participate. In one weekend study, one of the subjects was a totally blind woman. She entered into all the activity including a game of charades. One other handicapped person, a man having only one hand, participated during the third one week study. He participated in much of the hard work such as dismantling and reconstructing the bunks.

One woman in the first study had suffered a cracked coccyx several weeks prior to her stay in the shelter. She was given permission to take a pillow ring with her to sit on in the shelter and she did not seem to have any trouble either sitting on the hard chairs or getting in and out of the bunks.

The evening before the start of the final test two subjects (a woman and her son) were involved in an automobile accident. On entering the shelter the next morning they were suffering from cuts and bruises sustained in the accident. The

woman suffered from nausea and some stiffness during the first two days in the shelter but after that neither she nor her son had any physical complaints.

One other person in a questionable state of health was a woman, also in the fourth study. She had been confined to bed suffering from pleurisy prior to entering the shelter. For the first four days she was kept under especially close surveillance. She looked pale and her eyes were very watery. Her symptoms, however, disappeared by the end of the first week and she was fine throughout the remainder of the study.

## IN-SHELTER MEDICAL PROBLEMS

Some physical ailments did develop inside the shelter. These are summarized in Table XXIV. The most prevalent complaint was of headaches. Stomach cramps were also common. The instance of upper respiratory ailments was high compared to other ailments but lower than had been anticipated and much less serious. This is probably largely due to the tests being conducted in the spring, when respiratory ailments in the Pittsburgh area are relatively infrequent. Only 38 out of a total of 120 subjects reported coughs or cold symptoms.

**Table XXIV. Diary Reports of In-Shelter Physical Complaints**

| | Headache | Upset stomach | Diarrhea | Constipation | Cough or Cold Symptom | Sore Throat | Muscular Soreness | Tired or unable to sleep | Skin rash or irritation | Other |
|---|---|---|---|---|---|---|---|---|---|---|
| Group I | 10 | 18 | 1 | 0 | 11 | 3 | 3 | 1 | 0 | 3 |
| Group II | 10 | 1 | 1 | 2 | 25 | 10 | 4 | 2 | 1 | 2 |
| Group III | 13 | 11 | 0 | 2 | 0 | 2 | 0 | 0 | 5 | 2 |
| Group IV (week 1) | 17 | 3 | 0 | 3 | 2 | 2 | 0 | 0 | 2 | 6 |
| Group IV (week 2) | 7 | 4 | 0 | 7 | 0 | 0 | 2 | 1 | 1 | 1 |
| Total | 57 | 37 | 2 | 14 | 38 | 17 | 9 | 4 | 9 | 14 |

It is interesting to note that in Group II (a group having the "comfortable" temperature) there were 25 reports of cold symptoms, but in Group I only 11, Group III none, and Group IV 2. Although many subjects reported having colds, no one reported his temperature as being over 100° at any time. (Each subject had his own thermometer and took his temperature once a day and was instructed to notify the the observers by means of the emergency phone of any temperatures over 100°.) Conversations in the shelter overheard by observers and post-test interviews suggested that some people had elevated temperatures and did not record them. There was high motivation to "stick it out;" much "I can take it!" feeling which made people hide the fact that their temperature was elevated over 100°. They

thought they might be forced to leave the shelter if the observers knew about elevated temperatures.

The first night of Study I the observers noticed that one of the older women was not feeling well. She appeared to be nauseated, made many trips to the lavatory, and seemed very warm (someone put damp cloths on her head and arms). She did not, however, request to leave although she was assured by the shelterees that she would be released if she wished. At the end of the week she admitted she had a history of severe claustrophobia prior to entering the shelter. She felt miserable the first night in the shelter and had longed to be home, but she had been determined to "stick it out" and was proud of the fact that she had been successful and stayed out the week. This "stick it out" attitude was common and could account for some illness and elevated temperatures remaining unrecorded.

## ATTITUDE TOWARD MEDICAL PROBLEMS

The attitude among the shelterees toward illness seemed to be one of indifference. Generally they took the attitude "if we ignore it, it will go away." There was little they could do anyway to treat medical problems because of the limited supply of medications available.

At the post-shelter physical the subjects were expected to confess the illness and elevated temperatures experienced in the shelter. There was, however, a marked tendency to minimize medical problems. For example, one woman in Group I developed a bad cold. The observers noted her symptoms – pale complexion, swollen, bloodshot eyes, profuse perspiration, runny nose and confinement to bed. At one point a discussion was overheard and it was learned that this girl had a fever over 100°. At the post-shelter physical and interview she avoided mention of her illness and, when asked specifically about it, tended to minimize it by merely stating that she had had a cold but it had not been too bad and it had gone away quickly.

This trend toward minimizing medical ills is evidenced in the response to a question on the follow-up questionnaire which each subject received after his shelter experience. The question asked, "Did you have a 'cold' immediately before, during or after your shelter experience?" The answers to this question are summarized in Table XXV.

The instance of colds in the shelter reported on this questionnaire does not correspond with the diary reports of colds as reported in Table XXIV. The fact that 38 people reported colds in their diary and 19 reported colds during their stay on the follow-up questionnaire suggests forgetting and/or another attempt by the subjects to minimize unpleasant aspects of their shelter stay.

Therefore, due to the contradictory recordings of observers and the subjects and the tendency on the part of the subjects to minimize medical problems, it is difficult to determine exactly the medical problems that did occur in the shelter. The fact that no one requested to leave because of illness and the omission of

post-shelter comments relating to medical problems in the shelter point to the fact that few problems existed and those that did appear were not of a serious nature.

**Table XXV. Instance of "Colds" Reported by Subjects on Follow-up Questionnaire**

| | None | Before shelter entry | During shelter stay | After shelter exit |
|---|---|---|---|---|
| Study I | 22 | 0 | 0 | 2 |
| Study II | 6 | 2 | 13 | 11 |
| Study III | 18 | 1 | 2 | 6 |
| Study IV | 20 | 3 | 4 | 0 |
| Total | 66 | 6 | 19 | 19 |

## POST-SHELTER MEDICAL PROBLEMS

No subject, on the basis of a follow-up questionnaire, has reported any lasting physical complaint as a result of his stay in the shelter. The number of subjects naming various complaints on a follow-up questionnaire are shown in Table XXVI.

**Table XXVI. Post-Shelter Complaints**

(Based on follow-up questionnaires completed by 94 subjects)

| | No. of persons reporting |
|---|---|
| None | 44 |
| Poor Coordination or weakness | 11 |
| Tiredness | 18 |
| Headache | 6 |
| Digestive | 2 |
| Muscular Stiffness or Pain | 9 |
| Miscellaneous | 16 |

These complaints were of a temporary nature with everyone feeling normal within a week and in most cases within two days after leaving the shelter.

# CHAPTER 12. PROBLEMS

## GENERAL

Subjects' diaries, post-shelter questionnaires and interviews, and follow-up questionnaires revealed no outstanding problems which were recognized by the participants in the study. This is compatible with the feeling of the project staff that shelter habitability as defined by these experiments involved a surprisingly small number and severity of problems from the behavioral sciences point of view. There are, however, at least three problem areas which are felt to warrant special attention. Participants in these studies can be assumed to be highly motivated and thus have a tendency to de-emphasize problems which occurred in shelter. Three behavioral sciences problem areas identified as a result of this study are:

- Lack of sleep
- Conflict of values
- Stresses of leadership

The third problem, stresses of leadership, already has been considered in Chapter 5 of this report.

## LACK OF SLEEP

Lack of sleep was not recognized by the shelter inhabitants as an overwhelming problem, although its over-all evaluation as a discomfort factor resulted in a rank of six. Individuals who obtained less than three hours sleep during a given night often would, on their diaries, rate the adequacy of their sleep during this period within the range of "slept very well" to "had no trouble sleeping." This lack of awareness of sleep deprivation possibly may be attributed to the in-shelter living absence of the usual criteria for evaluating fatigue such as normal job requirements and other routine daily activities. Observations of both behavior and physical appearance, however, indicate that fatigue took its toll of the shelter inhabitants. Physical evidence of fatigue included sagging facial muscles, drooping posture, frequent yawning, headaches and even some nausea. Behavioral symptoms included poor concentration, difficulty in making decisions, and general lethargy. While some of these symptoms may be associated with warm temperatures or other factors of shelter living, individuals were observed to exhibit these characteristics to a lesser degree on days when they had obtained considerable sleep.

While the warm temperature and strange surroundings undoubtedly contributed to the difficulty in sleeping, the primary disturbing factor was the difference in time of retiring and amount of sleep to which the various members of the group were accustomed. As has been indicated elsewhere in this report, the establishing and maintaining of quiet hours was a major source of conflict within all of

the studies. In addition, the usual results of sleep loss, such as general irritableness and lapse of attention may have serious ramifications in an actual survival situation.

The role which lack of sleep apparently played in the adjustment difficulty of Mr. Black and the depression of Mrs. Grey also must not be ignored. Even though the lack of sleep may well have been a symptom rather than a cause of generally poor adjustment, the fatigue resulting from sleep loss probably added to the already poor adjustment. A third individual, who seemed to hold up fairly well during her shelter stay, exhibited near hysteria at the time of her release. She attributed this to fatigue, commenting that "I didn't realize how tired I was while I was in the shelter." Upon returning home she slept for "a couple of days" and then reported that she felt completely recovered.

The behavior of the managed groups, in which the leaders had been made aware of the sleep problem, indicates that such awareness should serve to somewhat reduce this problem. However, further study is necessary to identify techniques for the assurance of adequate sleep for all members of the shelter population.

The presence of children under six and infants will almost certainly increase the sleep problem substantially beyond what it was in the current study.

## CONFLICTS OF VALUES

The conflict of values presented another major problem in shelter living. Different values concerning remaining quiet so others could sleep provided one source of stress. Conflict of values also appeared in the areas of:

- Acceptable language
- Gambling
- Sanitation and Cleanliness
- Sexual Expression
- Observance of the Sabbath

Such conflict can be expected to occur in group shelters containing individuals who differ greatly with respect to age, intelligence and socio-economic level.

### Acceptable Language

Tension in relation to profanity was increased because of the presence of children in the shelter. In the unmanaged groups profanity was used rather freely, despite the fact that the emergent leader in one of these groups had his three young children in the shelter with him. At the first occurrence of profanity in one of the led groups the appointed manager took the firm stand of forbidding it completely. He was not challenged. Profanity never became a problem in the other managed group. This may have been because of the greater formality of the leadership in this group, which discouraged even the tentative expression of profanity.

### Gambling

Gambling occurred to some extent in all shelter groups. It was extremely heavy in Group III, where several individuals lost all of the money (7-8 dollars) which they had brought into the shelter with them. The major problems created by gambling in the shelter were the tensions which arose among those participating when relatively large losses occurred, and the expression of disapproval by the non-participants. It is interesting to note that tensions arising among those who were gambling occasionally originated with a heavy winner rather than an individual who was losing consistently. The losers usually borrowed small sums of money and, losing that, withdrew from the game for the remainder of their shelter stay. Heavy winners, however, often put pressure on other shelterees to participate in the gambling, particularly when the losers began to drop out.

Another tension associated with gambling was created by a few individuals, who after losing their money, continued to participate as very active kibitzers rather than completely withdrawing from the game.

Although gambling was not a major problem in most of the groups, the evidence cited above is presented to illustrate the tensions which may arise from such a shelter activity when this activity is carried to an extreme.

### Sanitation and Cleanliness

Sanitary conditions within the shelter usually were very good. However, there occasionally was a conflict of values in this area. For example, when several shelterees developed upper respiratory ailments during Study I, there was some discussion as to the necessity of sterilizing the eating utensils following each meal. A strong minority faction opposed this plan, which nevertheless was eventually put into effect. The difference in values among members of the group is evidenced by the general attitude toward shelter sanitation. One faction in Group I advocated fairly strict sanitary measures with the idea that it would be possible to maintain a relatively high degree of shelter cleanliness. Others in the group, however, tended to de-emphasize such procedures on the basis that that "there will be maggots in the garbage and lice on the people no matter what we do." Group leaders emerged from both of these factions. This difference in basic attitude is indicative of the effect of differences in background on values in shelter living.

### Sexual Expression

Perhaps the most severe conflict of values which appeared in these studies pertained to the expression of sexual responses while in the shelter. The problem of actual sexual relations among married or unmarried couples in the shelter was nonexistent. Sexual expression among the adults was limited to some hand-holding and an occasional kiss by married couples and verbal responses, including light banter pertaining to sex, and some confidential conversations between a few individuals concerning their sexual tensions. Only one adult was observed to express any concern over the control of her behavior during her stay in the shelter.

She confided her problem to the shelter leader, and reported a lessening of tension after following his advice of writing love letters to her husband who was not in the shelter. As far as can be determined her tensions never became apparent to the other members of her group.

One problem probably related to adult sexual behavior was the teasing of the young men in one group by a thirty year old woman whose husband was not in the shelter. Although primarily verbal, in the form of conversations pertaining to or fringing on sex, this teasing also was physical to the extent of moving very close and/or putting her arm around the man to whom she was talking. This action was very subject to a conflict of values, since the significance of such behavior may be interpreted very differently according to the society in which it occurs. The young men involved in this situation responded aggressively with remarks which, although made in a joking manner, were often very cutting and personal in nature. The woman then would lose her temper, and this situation along with the frustration-centered responses of the men often led to tense situations which had to be resolved by the shelter manager.

A real conflict of values, however, occurred in relation to the problem of teenage petting. This occurred to a varying degree among three of the experimental groups. The tension created through a conflict of values concerning this behavior depended upon the amount and intensity of the petting which took place. A surprising amount of heavy petting occurred in Group I, particularly when one considers the lack of privacy within the shelter and the constant observation to which the participants knew they were being subjected.

It is interesting to note that no young couple in either of the unmanaged groups was ever criticized directly for this behavior, yet this activity greatly disturbed a large number of adult shelterees. This was evident in diary reports, post-shelter questionnaires, and post-shelter interviews. The conflict of values within the group is obvious in this case. It seems very clear that the teenagers themselves had very few guilt feelings about such behavior. One couple engaged in petting while on watch, carried on a brief conversation concerning the fact that they were being observed, and then resumed their petting. Many of the adults, and particularly the older women and mothers whose children were in the shelter were so opposed to this behavior, however, that some of them indicated in their post-shelter interview that they had considered leaving the shelter. Although these individuals frequently discussed the situation among themselves while in the shelter, no one but an appointed shelter leader ever requested the curbing of such activity. The general feeling, as expressed in later interviews, was "they aren't my children and it is not my place to say anything." When such an admonition did occur in a managed group, however, any behavior beyond handholding was completely eliminated. Moreover, when approached directly concerning this problem the teenagers complied with the leader's request with no visible expression of resentment or hostility. Teenage petting was in no way a problem in those shelters with a structured management program. The unfortunate fact is, however, that when petting was permitted to continue in a shelter a great deal

of tension was created among the adult population, as later reported in post-shelter interviews.

### Observance of the Sabboth

Religion played a significant role in shelter living, with a shelter chaplain sometimes emerging within the group. Sunday religious services were held by every shelter group. A considerable amount of religious tolerance was exhibited by most of the shelterees. Objection to religious services usually was manifested in passive non-participation rather than aggressive opposition. However, it is because of the apparent importance of religion in the experimental situation and the even greater emphasis anticipated during an actual emergency that the potential conflict of values which could occur in this area is especially worthy of note. Rejection of religion in this study ranged from sleeping during the Sabbath service to declaring "nobody is going to keep me from gambling on Sunday." In actual emergency, where both the stressfulness of the situation and the importance of religion to some individuals is greater, the latter attitude could result in serious tensions within the group.

Religious themes expressed during discussions and formal services in the shelter generally emphasized one of two theses.

- The sin of man as the factor responsible for worldly disaster.
- Hope for salvation through faith in God.

The story of Noah's Ark, which was a theme for a shelter sermon could, for example, be approached according to either or both of these theses.

Whether or not the practice of religion will become a source of conflicting values in a shelter situation may depend upon which of these two approaches is pursued by the theists in the group. The theme of hope through faith may be expected to receive at least the tolerance observed in this study. An attempt to place responsibility for the catastrophe upon the sins of those in the group, however, probably would emphasize the difference in values within the group and increase tension in the shelter.

### Conclusion

Several sources of conflicting values within the shelter population have been identified. These were conflicts observed as part of this study. An actual shelter situation may present other problems, while some of those mentioned here may be relatively unimportant. The important factor to be emphasized from the available data, however, is that conflict of values occurs within shelter groups in relation to at least some aspects of shelter living. Problems associated with this conflict of values were magnified by three factors observed during these tests:

- Particularly in groups without a trained leader, people with relatively low standards seemed to have a disproportionate effect on group standards.
- Older persons with socially higher standards often withheld their disapproval rather than expressing it to the conflicting group.

- The older women with extremely high standards often had low group status, making them relatively ineffective in expressing their points of view.

There is a strong indication that well planned shelter management can reduce such conflict of values. However, further research is necessary to provide a systematic approach to this problem.



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# CHAPTER 13. CONCLUSIONS

## LIMITATIONS

### Simulation

The conclusions which can be drawn from the study are limited in part because of the basic purpose of the study. This purpose was to determine the reactions to confinement as a general condition, not to determine reactions to confinement under attack. A shelterlike situation was used for the confinement, but it was not the purpose of the study to simulate real attack conditions in a psychological sense. Consequently, conclusions cannot be drawn directly concerning the behavior of persons in a real attack situation. Rather, the conclusions must be limited to an estimation of the impact shelter confinement *per se* will have on behavior. The impact of actual danger, knowledge of possible consequences of a real attack, possible physical or psychological trauma from the attack or efforts to enter the shelter, and separation from loved ones who may be in peril was not a part of this study. Therefore, no conclusions can be drawn concerning possible interaction between the stresses of an actual attack situation and the additional stress of shelter confinement.

### Sample

A second major limitation on the conclusions that can be drawn from this study results from the sample of subjects who participated. Five principal selective factors may have affected the generalizability of results from this study:

- **Attitude toward civil defense.** On the average, subjects in this study probably had a more favorable attitude toward civil defense than most Americans. To the extent that a favorable attitude toward civil defense might cause better adjustment to shelters, results of this study might result in unduly optimistic conclusions concerning general adjustment to shelters.
- **Physical and mental health.** Critically ill persons obviously would not volunteer for this study. Conclusions concerning the care of such persons cannot be drawn from this study. In the one case in which a group felt that one of the subjects was having serious adjustment difficulty, there was a strong negative effect on morale. There are insufficient data from this incident to draw firm conclusions, but it affirms the desirability of intensive study of the problem of the psychologically disturbed in shelters.
- **Infants.** Since the current study included no children under seven years of age, no conclusions can be drawn concerning the in-shelter care of infants and preschool children, nor can the impact of the presence of such children on others be assessed.
- **Gainfully employed.** Because participation in this study required subjects to be absent from work for a full week or two, it was very difficult to obtain a sufficient number of gainfully employed persons, particularly men over 30, to provide a representative sample. Since gainfully employed men

over 30 seemed to provide a stabilizing influence on the group, their relatively small number in each group makes it difficult to draw conclusions about shelter groups having a more representative proportion of gainfully employed men.

- **Self selection.** There are undoubtedly many personal problems relevant to shelter adjustment which would cause people not to volunteer for this study. Some of the more obvious of these problems are:
  1. Fear of enclosed places
  2. Fear of public exposure
  3. Bed wetting
  4. Drug addiction
  5. Alcoholism

  Although one woman with an intense fear of enclosed places and one man with an obvious drinking problem did participate in the study and came through the shelter experience in good condition, it is probable that there were a disproportionately small number of subjects with such problems. The importance of such problems in shelter adjustment was exemplified by the severe nausea and "almost" a request to leave during the first two days of confinement on the part of the claustrophobic woman.

The fact that subjects received a modest remuneration for participation does not, in itself, seem to have major implications for the conclusions that can be drawn from this study. However, the fact that most volunteers had to be accepted, and for the groups for which they were available, made it impossible to match groups closely on all personal history variables. This restricts the firmness with which conclusions can be drawn from group comparisons.

### Statistical Significance

Because time and funds made it impossible to conduct tests with more than one group under a given set of experimental conditions, conclusions concerning the effects of these experimental conditions must be drawn with considerable caution.

## GENERAL CONCLUSION

Results of this study support the generally optimistic conclusions from shelter habitation studies in Sweden (Brand-Persson, 1960), Germany (WGCDT, 1959), England (Natl. Acad. of Sci., 1960), and the United States – both with family (Vernon, 1959) and group (Strope et al, 1960) shelters. The inclusion of women and children from age seven and up in this simulated group situation did not result in any overwhelming psychological or social problems. There were, in fact, fewer and less severe problems than had been anticipated, even with knowledge of the previously cited work.

Despite the numerous limitations described above, results of this study, when taken in conjunction with previous habitability research, suggest that shelter confinement *per se* will not be overwhelmingly stressful if reasonable management, space, ventilation, temperature, sanitation, light, and sustenance are

provided. Major areas of additional fruitful research appear to be not so much along the lines of refining estimates of the exact limits and effects of these various factors as in studying some dimensions of shelter habitability which have not yet been given adequate empirical test. Some of these dimensions are:

- Inclusion of hitherto largely untested groups in representative shelter populations. Especially:
  1. Infants and children of preschool age
  2. Mixed races, particularly in areas of known racial tension
  3. Physically ill or handicapped
  4. Psychologically disturbed
- Tests with limited, but realistic, special populations. Especially:
  1. School children with teachers
  2. Hospitalized patients
  3. Neighbors, both with and without working members of the family
  4. Working groups from the same organization
  5. Downtown, daytime populations
- Determination of the factors which will enhance sleep and minimize conflict of values concerning appropriate shelter behavior; for example, remaining quiet at night, gambling, petting, using profanity, expression of religious belief. Sleeping difficulties and conflict of values were two incipient problems identified in this study which might be of increased significance in an actual shelter situation.
- Development and test of guidance and training material for shelter managers.
- Determination of the possible tradeoff between trained managers and guidance material specially prepared for relatively untrained management.

## SPECIFIC CONCLUSIONS

### Space

The eight square and 58 cubic feet provided per occupant for living, storage and lavatory space in this study was adequate for emergency living for up to two weeks. Neither crowding nor lack of privacy resulting from this close space was a sufficiently serious problem to suggest that more space is required so long as adequate ventilation and temperature conditions can be maintained. Adequacy of eight square and 58 cubic feet per occupant depends upon efficient design of the space, principally demountable bunks that can be taken down or converted into seats for daytime use.

Although no precise conclusions can be drawn from the informal 20-hour test with 5.9 and 42.8 cubic feet per occupant, the concensus of participants and observers was that capacity for a manageable group had not been reached but was being approached. On the basis of total results from this study and a review of previous habitability studies, it is recommended that a test be undertaken with about 5.4 square and 39 cubic feet per occupant under a staggered sleeping schedule described in Chapter 3.

**Temperature**

Peak effective temperatures of about 85°F each day were tolerable, but appeared to be close to the upper threshold of physiological tolerance for some individuals. Within the limits of temperature in this study, however, (effective temperature from about 72°F to 85°F) it seemed to have relatively little influence on either social structure or psychological adjustment.

This study had no results suggesting a change in current Office of Civil and Defense Mobilization standards that shelter temperature should not exceed an effective temperature of 85°F. However, results of this study are not sufficiently conclusive to preclude useful testing at temperatures in excess of 85°F effective temperature. If conducted, however, it is recommended that the planning and conduct of such tests be closely monitored by physiological and medical experts.

**Management**

Trained and designated managers increased the overall adjustment to shelter living and enhanced attitudes toward shelters, civil defense, and people in general as compared with shelter groups not having trained management. Extrapolation to the real shelter situation would suggest an even greater importance for the shelter manager than was the case in the simulated situation.

The management materials prepared for this study, described in Appendix D to this report (separately bound), showed sufficient promise to suggest additional study and development for more general use.

**In-Shelter Training**

Under the guidance of a trained manager, it was feasible to provide in-shelter training which was effective in teaching shelterees information relevant to in-shelter and post-shelter survival. The training appeared to be well received by shelter groups and was widely participated in by the shelter groups. No results from this study suggested that in-shelter training would be unfeasible in a real shelter.

**Design and Discomfort Factors**

Design of bunks for easy conversion from night to daytime shelter configurations appeared to be a major factor in making adequate a small amount of space per occupant. The greatest overall source of discomfort was lack of water for washing, although high temperature was an even greater source of discomfort for groups having an effective temperature up to about 85°F.

Since maintenance of effective temperature below 85°F is often difficult and expensive in shelters, results of this study do not seem to warrant major efforts to achieve temperatures lower than this upper threshold, although lower temperatures are clearly desirable if they can be easily achieved.

Availability of even small amounts of water for body bathing and/or an occasional change of clean clothes would seem to be significant sources of improved habitability.



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**Time In Shelter**

Agitation and tension were greatest immediately following shelter entry and prior to release. Depression was common toward the middle of shelter stay. All of these effects were reduced when a trained and designated manager was present.

Desire to leave mounted steadily from the time of shelter entry, but did not become overwhelming within a period of two weeks.

**Individual Adjustment**

Of the variety of personal history and psychological test data obtained concerning each subject, only age seemed to be significantly related to shelter adjustment with younger subjects having somewhat better adjustment than older subjects. The only substantial predictor of leadership performance seemed to be general intelligence with more intelligent subjects showing a greater tendency to lead. On the basis of observation and interview, shelter adjustment seemed to be a fairly direct reflection of the individual's general social adjustment pattern. There was some observational evidence relating to individuals with poor leadership success in their private life. When such individuals tried to assume leadership responsibility in groups with no designated manager, they did so at a cost to their own adjustment and the adjustment of others in the group.

**Interpersonal Behavior**

There was a general lack of serious direct interpersonal conflict in all groups. Strong friendships grew rapidly and *esprit de corps* became quite strong, although this *esprit de corps* was disrupted in one group by a serious personal adjustment on the part of one subject. Personal dislikes, as revealed in post-shelter interviews, were usually well controlled even though not entirely hidden.

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